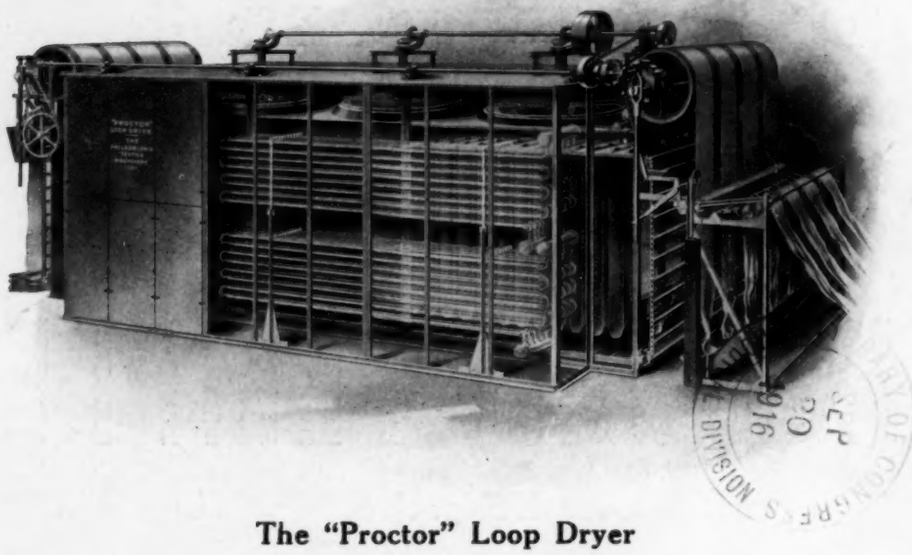
ANNUAL DYEING, BLEACHING AND FINISHING ISSUE

COTTON

Volume LXXX
Number Eleven
Ten Cents a Copy

SEPTEMBER, 1916

Published Monthly by
W. R. C. Smith Publishing Co.
Dalton, and Atlanta, Ga.



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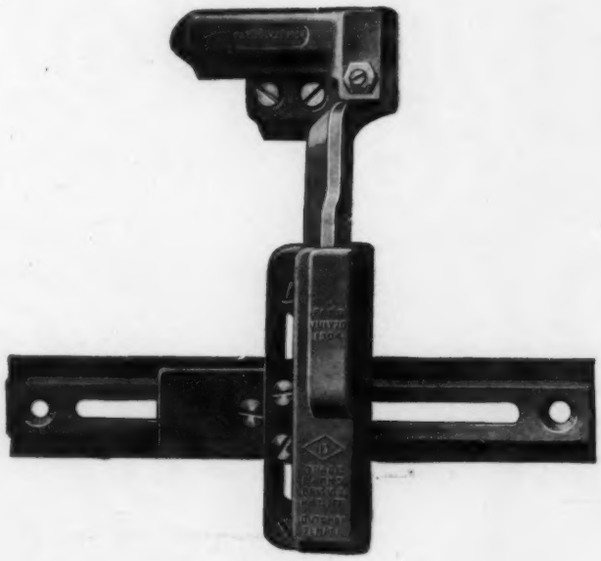

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Published Monthly by

W. R. C. Smith Publishing Co., Dalton and Atlanta, Ga.

L. L. ARNOLD, Editor.

Editorial and Advertising Departments Grant Building, Atlanta, Ga. Subscription price, $1.00 for two years; Canada, $1.00 a year; Foreign, $1.50 a year. Entered at the Dalton, Ga., postoffice as second-class matter.

Contributions to the columns of Cotton are solicited and paid for after publication. The names of contributors need not necessarily be used, but must accompany all manuscripts.

Orders for any change in advertising must reach Atlanta previous to the 10th of the month preceding month of issue, otherwise publishers cannot be responsible for changes.

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Volume 80. Member Audit Bureau of Circulation. Number 11

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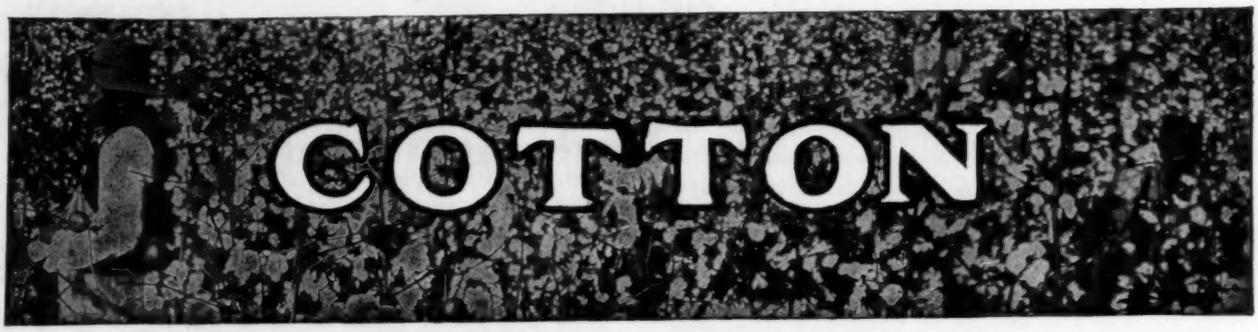

September, Nineteen-Sixteen.

Colleges and Chemical Education.

Some rather bald facts were presented to the members of the National Association of Cotton Manufacturers in Boston last April, by Frederic Dannerth, Ph. D., chairman of the Committee on the Textile Industry of the American Chemical Society, Connecticut Section.

Dr. Dannerth was discussing a research into the underlying causes for the lack of an American dyestuff industry, a subject which has provoked much study and discussion since the outbreak of the European war. As it is well known that dyes and the coal tar industry are industrial developments of what is known as organic chemistry or the chemistry of carbon compounds, he decided to obtain some definite idea as to the amount of attention given to the study of this subject by American colleges. In other words he attacked the subject from an educational standpoint.

During his investigations an examination was made of the courses offered by five of the large eastern universities of the United States as compared with European practice. Speaking of these investigations, he said:

"This investigation showed that the total number of hours of instruction offered in a year of thirty weeks varies from 550 to 600 hours. It should, of course, be remembered that this amount of instruction is probably spread over two or three years as there are other subjects which occupy the attention of the student aside from the study of organic chemistry. But, it will be urged,—the students at American colleges are given more extensive instruction in the chemistry of minerals (inorganic chemistry). This would hardly seem to be an adequate excuse when we stop to consider that the four principal inorganic industries in Germany, namely: steel, glass, fertilizers, and sulphuric acid, are as strongly developed as the four principal organic industries, namely: textiles, leather, paper and rubber. The German colleges have, however, elected to lay particular stress on the more difficult fields of organic chemical research. Our chemical knowledge of textile fibers, of dyes, of leather and rubber is not by any means complete, and it is this, probably more than anything else, that has stimulated German chemists to greater effort in the field of research. An examination of the courses offered at universities in that country shows that the lectures and laboratory work in organic chemistry offered during the year of thirty-six weeks totals in round numbers 1200 hours, and the chemical laboratories are actually open for the use of the student for almost 1000 hours in the year. A student is at liberty to work in the laboratory from 7 A. M. to 7 P. M. in almost every German university. This, it will be seen, offers a sharp contrast to the opening and closing hours so rigidly observed at our American colleges.

"A student who has satisfactorily covered the course in mineral chemistry and analysis, has then an opportunity to spend 1200 hours in one year for special studies and lectures in the field of organic preparations together with the synthesis and analysis of well known organic compounds. After having completed this part of the course satisfactorily he is induced to begin an original investigation on a problem chosen by his instructor or by himself, and this occupies about two years of his time.

"I have gone into considerable detail regarding this matter of carefully planned college work in organic chemistry because it is my firm belief that we in the United States will make very negligible progress in the manufacture of dyes, unless we begin now to educate chemists in our colleges in such a way that they can become useful and efficient research chemists in the difficult field of organic synthetic chemistry. If you will take the pains to interview the superintendent in a modern tannery, dyehouse, paper works, or rubber goods factory, you will find out how very difficult it is to obtain the services of college trained chemists who have much valuable knowledge in the methods of organic chemistry. Yet these are the very industries which require chemical control to a considerable extent. An examination of the German industrial establishments proves this beyond the shadow of a doubt. But we have in many cases contented ourselves with imitating the discoveries, and methods of the German industrials several years after the Germans have gotten a foothold.

"In view of these facts it appears very desirable that one or more of our large associations of manufacturers inquire into the courses of study now offered at our larger universities to determine the amount of time and attention now being given to (1) organic preparations and syntheses; (2) organic preparations and analyses; (3) organic research, theoretical; (4) organic research, industrial; (5) industrial organic analyses. It would be at least interesting to dsicover how much of the students' time is devoted to the lectures and the laboratory in these subjects.

"If our principal American colleges are willing to modify their courses of instruction and make them more rational, we may hope to secure adequately trained chemists for our American industries in four or possibly three years from today. But the change will have to be made soon, for the courses as they stand today, and the men as they are being graduated from our schools of chemistry today, offer little hope for a proper organization of our American coal

tar industry. The textile industry is perhaps the only one which can boast even a technical school for the mechanical processes, but in the case of the leather, paper and rubber industry, it is still necessary to take raw college graduates and teach them the principles of the industry at the expense of the manufacturer who employs them."

These are questions well worth serious consideration, particularly in the South where the average training in chemistry does not compare favorably even with the schools criticised by Dr. Dannerth. Furthermore, because of past experiences, many manufacturers have small confidence in the aid to be expected or obtained from their chemists outside of routine work.

There is too much indifference on the part of all manufacturers as to the value of properly applied chemistry in their business, and aside from the question of dye manufacture in the United States, more careful and generous chemical instruction in our schools, ably seconded by more thorough and broad-minded cooperation on the part of manufacturers generally, will do much toward bringing into full fruit the industrial potentialities of this Great Republic.

Protecting Children.

The Providence Journal for August 17th prints an editorial on "The Child on the Dump Heap," that is peculiarly interesting to those who carefully followed the course of Senator Lippett, of Rhode Island, during the recent senate debate on the national child labor bill. Can it be possible that such carelessness toward child health is allowed—in Rhode Island?

The *Journal* says:

"The infantile paralysis scourge has called public attention to a species of child labor which State laws, as a rule, have overlooked—the practice of parents, in humble circumstances, of sending children to the dump heaps to recover things of some household use or necessity.

"An investigation of this was made in Massachusetts, two years ago, and the findings are now republished, as of very timely interest. Many hundred children, between five and fifteen years of age, were discovered working on unhealthful rubbish heaps, stirring up the filthy dust at every step, and breathing it in as they bent down to pick up coal or wood or other treasures.

"Fruit found upon the dumps is frequently eaten on the spot. The child pickers work in all sorts of weather, bare toes sticking out of their shoes on the coldest days. In the winter, the skin of the little hands is cracked; in the summer, the sun heats the stretches of rubbish to the point of blistering the child's legs.

"In some cities, boards of health have forbidden this, but the order is not always persistently enforced. Manifestly, the child pickers are a proper subject for a community's sympathetic interest. They should be protected, for their own sake and as a measure of public health."

Otiosa sedulitas. If they must work, better by far have them work in clean, sanitary and comfortable surroundings. Legislated out of a means of livelihood they should be protected and supported by the state that has rendered them helpless.

Cotton Futures Act.

The annual appropriation bill for the Department of Agriculture recently passed by Congress contains a reenactment, effective September 1, 1916, of the United States cotton futures act, with a few changes. Section 11 of the former law, which taxes orders sent abroad for the making of future contracts on foreign cotton exchanges unless certain conditions were complied with, was omitted.

A new section known as 6a is inserted in the bill, which provides an optional contract under which parties may, by agreement, without being subject to tax, contract that under certain specified conditions the buyer may demand delivery of the basis grade named in the contract.

Another modification which will be of interest and assistance to the trade is the authority conferred on the Secretary of Agriculture, in case of disputes, to include in his findings, even though only one question is referred, a complete classification of the cotton for the purpose of delivery on future contracts. Under the old law, the authority of the Secretary was confined to a determination of the specific question of grade, quality, or length of staple referred to him by the parties. In other words, if the dispute involved grade only, and the cotton was found to be gin-cut, which is a question of quality, the Secretary had no authority to include a statement as to gin-cut in his findings.

The National Chemical Show.

That the chemical industries are alive to the situation they now occupy in the sum of affairs is evident by the great number of firms that have engaged space at the Second National Exposition of Chemical Industries to be held at the Grand Central Palace, New York City, during the week of September 25-30, 1916.

The managers anticipate an even greater number of visitors to attend this second exposition. The numerous chemical and engineering societies that last year had their attention divided with the attractions of the exposition and the engineering congresses on the Pacific Coast, and the first exposition of chemical industries in the east, have this year united and arranged to hold their annual meetings in New York during and in conjunction with the exposition.

The American Chemical Society will hold its annual meeting during the whole week—the program for the meeting is now being arranged and the committees appointed. A reception and a hotel committee will arrange that the members of the society will be comfortably located during their stay in New York. The capacity of the hotels about the Grand Central Palace will be greatly taxed to accommodate the host of visitors who will be in the city.

The Bureau of Commercial Economics at Washington are again co-operating with the exposition by arranging a most elaborate program of motion pictures covering subjects dealing with the industries depending on chemistry. Many of these films will have their premier showing at the exposition. They will take the visitor through industrial plants, shops, manufactories, mines, etc., where visitors themselves are never admitted—they will show operations which in ordinary light would never be seen, they will demonstrate more than any other kind of motion pictures the great strides and improvement in the art of photography.

The Present and Future of the Dyestuff Situation in the United States

The following opinions on the dyestuff situation are from men high in the industry and reflect present conditions and future prospects as seen from the viewpoint of the individuals named:

I. F. STONE, president of the National Aniline & Chemical Company, of New York, in speaking of the present situation of dyestuffs in this country said: "It will, perhaps, be interesting to start by comparing this situation with the situation one year ago.

"At this time last year, 1915, practically no shipments had been received from Germany or other European countries since early in the spring, and American agents for these factories were practically sold out of their stocks. No American factory had had time to increase its production by the erection of new buildings, etc., therefore the situation became very strenuous, and it was practically impossible to secure a sufficient supply of any color. Prices naturally advanced to almost prohibitive figures, that is, the consumers or dealers who had a stock of colors would only sell them because of the extremely high price they might get; one color for instance (Sulphur Black) being sold in considerable quantities at as high as $3.00 per lb. as compared with a normal price of about 20 cents per lb.

"In discussing the beginning of the clearing up of the situation, as far as supplies are concerned, I am compelled to speak particularly, and without prejudice to other factories, of our works, the Schoellkopf Aniline & Chemical Works, Inc., for whom the National Aniline & Chemical Company are selling agents, as they were the first to begin to relieve the situation. This factory was established in 1879 by two brothers, J. F. Schoellkopf and C. P. Hugh Schoellkopf, and has been run continuously since that time by these gentlemen. They, therefore, have the benefit of some thirty-six years of continued experience in the manufacture of aniline products, and as a consequence our factory is the oldest and largest of the American factories.

"Our factory was making, in addition to those colors which were made by other American factories, a good line of direct cotton colors, which were very much in demand. On Direct Black for instance, we had a possible production of about one quarter of the estimated annual consumption; the other three quarters being furnished by German and other European factories. Our production was immediately available for consumption, and did a great deal to relieve the situation as far as Direct Black was concerned. This was also true of other colors, although the quantities were not so large. It was our opinion that the war would extend over a considerable period of time, and we therefore made arrangements to increase production largely, as soon as possible. By the end of the year we had new factories in operation, which gave us a large increase over our ordinary production, and for this increased production we made contracts over this year, 1916, and consumers who made such contracts have been taken care of practically to the full extent of their contracts. Our increase for one color alone, for instance, the Direct Black already spoken of, was about four times the original production for this year and other colors in proportion. In addition to being a direct dyeing color for cotton, and mixed goods, it was found that by treating it with a formaldehyde solution, it made a nice fast black on hosiery, and therefore, replaced very satisfactorily the developed and other aniline blacks formerly used for this purpose.

"Fortunately it happened that our Dr. J. F. Schoellkopf, Jr., who had finished his education in German Universities, had given particular attention to the chemical industry, had been working on Sulphur Blacks and has been so successful that about November 1st, 1915, we were producing and delivering to consumers considerable quantities of this color. Thus we were the first, and are now the largest producers of this color in America.

"This Sulphur Black together with the Direct Black already mentioned, were of particular benefit to cotton and hosiery mills, where they were largely used, and those who had contracts with us have been able to run full this year on material on which they used these colors.

"Being an American industry, it was our policy to place contracts for raw and intermediate materials, as far as we could, with other American factories, even though we paid a higher price than we could have secured from Europe. The fortunate result of this policy was that after the war commenced and the importation of aniline oil and other intermediate products stopped, we continued to have our regular supply and were consequently able to produce our regular quantities of the colors which we made from these American intermediate products, and being, I think, the only factory who had placed its contracts with American factories, were the only ones who were able to run regularly through the strenuous year of 1915. We could not, of course, increase our production until we had new buildings, new installations and increased quantities of raw materials, the factories making these materials having also arranged to increase their facilities in the meantime.

"We did, however, make one mistake in making our prices for 1916 contracts, and that was, we did not look forward to the enormous increase in the cost of raw material such as benzole and like products, which resulted to us in a far higher cost on our additional quantity of raw material than we had figured upon, consequently it increased our cost of production of colors much more than we expected. We have, however, filled all of our contracts at contract prices, without making any attempt to advance, but for 1917, in order to cover ourselves on this increased cost of raw material, new buildings, installations, etc., we were compelled to advance prices over the 1916 prices, so that by the end of the year we would have profit enough to cover the cost of the increase in raw materials, buildings, etc.

"The extent of the increase in production will be at once understood when I say that we will have spent in the near future several millions of dollars for this purpose, which in addition to the capital or money employed in our old factories, gives us a large investment and makes us compare favorably with some of the European factories in size and production.

"In addition to our own factory before the war, there were four other factories who made a limited line of aniline colors and these factories also largely extended their

production and increased their facilities in much the same way as we have, although not, I think, on anything like so large a scale. Two of these factories, however, are controlled by German factories, one of them being owned outright by a large German factory and the other, since the war, having sold its control to the representative of another large German factory, so that the increase in production of these two factories is more or less restricted to such colors as will not compete with their German principals. Therefore the bulk of the trade is really in the hands of the three other factories who are entirely independent of foreign concerns, and are financed entirely by American capital and American facilities. These three factories, particularly, are doing the most to relieve and clear up the situation, and in 1917 will be able to produce enough staple colors to take care of the demand, if the consumers are careful enough to make contracts for their supplies at this time, so that these factories can be prepared with the necessary installations and raw materials to make the colors for which they accept contracts. Speaking for our own factory, we are willing to increase our facilities to practically any extent as long as consumers will support us by making contracts.

"The German factories in years gone by, have made large amounts of money on their products, and as a consequence their factories have been charged off from these profits so that their capital stock as a rule does not represent more than one quarter of the amount of capital employed in their operations, and this is one reason why they are able to pay the large dividends which they have been paying, viz.: 20 to 30 per cent annually, even though in America particularly they cut the prices to almost no profit in order to prevent the increase of American production. This is now what the American factories are trying to do, viz.: using all their profits for the erection of their new factories and if possible have them paid for by the end of the war and so be on the same basis as the German factories, and overcome this heretofore, insurmountable advantage. Some of the German factories also have the advantage of a large profit on the manufacture of pharmaceutical products, which line has so far not been taken up by American factories, although it may be, later on, and this is another reason why the Germans were able to make such low prices on colors; in other words they made up in profits on pharmaceutical products what they did not make on colors.

"In saying as I have, that the American factories will be able to take care of the whole demand of American consumers, I do not mean to say that they will make every color which has hitherto been furnished by European factories, but that they will make a staple line of colors which will enable any consumer to produce a line of shades to answer all reasonable requirements. For the colors which are not made in this country, what I might call the luxury colors, that is, colors not actually necessary but very useful, it is possible that the new submarine service which the Germans are trying to establish with submarine boats like the "Deutschland," will be able to furnish this country with enough of such colors to provide the special shades and requirements which may not be furnished by American factories, but this is not so necessary as it is desirable, that is, it is not actually needed but would be very welcome in addition to those colors which are made here.

"I have spoken so far only of five factories which were actually in operation before the war, and which went through all of the intense competition with the European factories prior to that time, because I believe that these factories are entitled to the first support of American consumers, rather than the newer factories which have been started since the war. When the war is over, some of these newer factories will not be able to stand the competition which will naturally ensue.

"Aside from the manufacture of aniline and sulphur colors, there have been quite a number of new factories established for the manufacture of what we call intermediate products, such as aniline oil, beta napthol, paranitranilin, etc., some of these manufacturers being very responsible and whose business will be continued in spite of European competition after the war is over, if conditions are favorable, that is if they have proper tariff protection and other government support. This is particularly true of aniline oil, which is now manufactured largely here, and it is doubtful if it will ever again be imported in any important quantity.

"In my opinion, if the Senate will increase the protection on aniline products in the new tariff bill (H. R. 16763) recently passed by the House of Representatives, giving them in addition to the present 30 per cent advalorem on aniline colors, 5 cents per pound specific duty, and in addition to the advalorem duty of 15 per cent on intermediate and raw products, 2½ cents per pound specific duty to 7½ cents per pound specific duty on aniline colors and 3¾ cents per lb. on intermediate products, in addition to the present advalorem duty, these being the duties suggested by the Committee appointed by the American Chemical Society, New York Section, in their report of Nov. 6, 1914 (of which Committee I was a member), after a most careful investigation of the situation, together with the anti-dumping clause which will prevent European manufacturers from selling their products here in this country at lower prices than they do at home in order to prevent the American production and also the increase in their production owing to the present war conditions—the American factories will, in the future, be in a position to compete with the European factories on more or less of an even basis, and the German monopoly of this business so long enjoyed by them, will be restricted to special colors on which they have patents or some particular advantage in the manufacture which cannot be had here. The American manufacturers will be able therefore to hold the bulk of the trade on staple colors and products which they are now manufacturing.

"The result to American consumers will be very advantageous as they will then be able to buy their colors at a staple and more average uniform price than heretofore, as it has been the custom of the German factories to get high prices on such colors as could not be produced here, while on the colors which were produced here, or could be produced here, they made prices which were out of all reason in proportion to what they sold them for in other countries; in other words, they sold at much less in this country than they should have in order to prevent American competition. Their average price, however, figuring the special and staple colors together as a whole, will be in my opinion higher than the average price of American colors, so the manufacture in America will be a great advantage to the public in general.

"With regard to the present high prices for American products, I would say that this is due entirely to the high cost of raw materials starting with benzole and its derivitives and continuing through acids and other various chemicals used for the manufacture of colors and other finished products. The high cost being caused by their demand for explosives and other war purposes, and as soon as the war demand is over, the large production which has been continuously increased to answer this demand, will be available for commercial purposes, and conditions will then become more normal, and the prices will be reduced and consequently the prices for colors and other aniline products made from them will be correspondingly reduced.

"The definite answer to your question, therefore, is that the present condition of dyestuffs supplies is very satisfactory, and the future outlook still more satisfactory in that everything indicates that a large business will be in the hands of American manufacturers instead of in the hands of European manufacturers as has been the case prior to the present war."

FRANS FRANKEN, president of the Holland Aniline Company, of Chicago, with factory at Holland, Michigan, urged greater co-operation between manufacturers and consumers and said:

"The present dyestuff situation represents an immense amount of hard work on the part of the American dyestuff makers to build up a permanent American dyestuff industry.

"The new tariff duties give full evidence that the government of this country understands the importance of such an industry, and the great progress of the domestic manufacturers in the past two years shows that faith in the success of a large American dyestuff industry is well founded. The progress made is actually of such an extent that it can hardly be realized by any one except those immediately connected with the industry.

"Certainly the government and the manufacturers are doing their part, far more than the American dyestuff users. The dyestuff users must realize the benefit of a native dyestuff industry, and act as forward looking men unblinded by petty interests.

"The biggest problem confronting the manufacturers is to secure the confidence of the American consumers.

"Actual co-operation of the dyestuff consumers with manufacturers means a re-inforced industry. The American consumers should deal with the manufacturers only and directly, and should eliminate speculators. Far-seeing manufacturers are opposed to artificially high prices. They want contracts at the lowest prices consistent with costs and risks of the business and are willing to include adequate protection to buyers on prices, so that the consumer who binds himself to take American goods after the war, is not visionary, but in the position of a calculating and competing man, however much the price of dyestuffs may drop after the war is finished.

"Therefore it is exceedingly important that manufacturers and consumers should get together and co-operate to improve this country's position, which is already better than ever before. Together they will establish a permanently safe and flourishing domestic dyestuff industry."

H. G. MCKERROW, manager of the textile department of the Marden, Orth & Hastings Co., Inc., of New York, believes that the subject which interests the textile mills of this country at the present time more than any other is that of the establishment of a dyestuff industry. Any manufacturer when approached on this question, will unhesitatingly say that it is the one active need of the textile industry, and that it is the duty and privilege of every manufacturer to do all in his power, both by indirect encouragement and by pledging his patronage, to support those who are willing to invest capital to this end.

"It is universally believed," he said, "that in order to effect the establishment of such an industry, Governmental assistance is indispensable, and that a method of protection in the form of a tariff so conceived as to enable the domestic industry to live against the well-established and experienced European competition is necessary, and even more, to enable it to offset any tendency on the part of European aniline manufacturers to dump on this market their products at prices which would make competition impossible.

"It is fair to state, however, that if all this discussion as to the establishing of a dyestuff industry in this country comes to nothing, the textile manufacturers themselves will be chiefly to blame. A considerable number of enterprising firms have invested many hundreds of thousands of dollars already in producing intermediates and dyestuffs without waiting for Governmental assistance, and no one who has not been through the experience appreciates what a vast amount of research, experimentation and discouragement confronts those who are endeavoring to create this industry. In order to justify their investment of capital and their optimism with regard to future developments, these concerns have naturally asked the textile manufacturers to support them to the extent of accepting contracts for the supply of the new materials as they come into existence, these contracts being for anywhere from one to three years. The manufacturers have apparently been willing to accept these contracts, and necessarily, the prices at which they have been effected are considerably higher on the various commodities than the normal prices prevailing in ordinary times when raw materials can be obtained on the ordinary basis of cost.

"Some six or eight months ago, when the mills were more or less panic-stricken with regard to the supply of their necessary dyestuffs, there was evidenced an almost universal willingness to accept these contracts at the prices asked and the dyestuff manufacturers were very much encouraged by the outlook and felt that they were being very handsomely and adequately supported by the mills. The last two or three months, however, have seen a very remarkable change in the situation. About that time the chemical and dyestuff market began to break, and having been maintained for so long at a range of factitious and exceedingly high figures, the mere rumor of a general break was sufficient to hold up anything in the nature of a general buying movement and a period of waiting to see just what would happen to the market ensued. This period of doubt and hesitancy has continued, and while those who have expended their money and time in making arrangements for manufacturing dyestuffs would be willing to accept this as an unavoidable condition and take their part in the period of waiting for a re-establishment of solid conditions, they have been confronted with a universal disposition on the part of the mills to repudiate and cancel the contracts which have already been taken; in other words, the dispo-

sition of the textile mills of this country is to regard these contracts as being effective just so long as the conditions are in their favor, but the moment the markets break and prices are reduced, they one and all commence to get out from under their obligations.

"To those capitalists and others who have already invested large sums of money in this new industry, it is perfectly evident that when the time shall come for the re-establishment of normal conditions and when European dyestuffs are again available at approximately normal prices, the contracts which have been made between American dyestuff manufacturers and the textile mills will not be worth the paper they are written on and the dyestuff makers will be called upon to meet any conditions that may be established by European dyestuff makers seeking to recover their lost market.

"This is not the kind of support and encouragement to which these people are entitled. American mills should appreciate that to establish conditions which will free them from the appalling position in which they found themselves at the outset of the European war, co-operation and self-sacrifice on their part are necessary. They must be willing to encourage the newly-born industry to the extent of supporting it by time contracts even at prices which are somewhat more than they have been in the habit of paying in normal and competitive times. It is a poor kind of patriotism which stops at the pocket. The mills of this country should appreciate that the manufacturers of dyestuffs cannot jump into the industry full-fledged and turn out products which in point of quality and price are immediately equal to those which have been produced by the long established and well-organized plants in Germany; they have to confront and overcome endless difficulties and their products are frequently somewhat disappointing at the outset until the fine points of organization and manufacture are acquired. Disappointments and delays in delivery are inseparable from the commencement of such work and costs are inevitably unduly high until system can be established which will reduce these to the lowest possible point.

"All this should be understood and appreciated by the textile mills and it is their part in their own future interests, to exercise forbearance and patience with those who are struggling to establish this industry, and above all, it is their part to display an unhesitating integrity in the matter of living up to the agreements they have made to utilize the new products in their work. Unless this is done and unless the textile manufacturers realize that they have an important part in the establishing of these new lines, no dyestuff industry will be created in this country and the mills will again find themselves absolutely under the domination of the European dyestuff manufacturers, dependent upon them for their supplies, and liable, should another catastrophe, such as the European war, take place in the future, to be brought to a point where their available supplies are reduced to a vanishing point and where the prices paid will be of the prohibitive character which have prevailed in this country for the last eighteen months.

"On the other hand, the dyestuff makers should recognize an obligation on their part to take care of mill requirements firstly and foremostly. There has been perhaps too much of a tendency on the part of the several dyestuff manufacturers to cater to the speculative interests rather than to the strictly manufacturing interests. This has resulted in quicker and more readily established business, but it has placed an unjustifiable handicap on the manufacturers by requiring them to pay the speculators' profits, rather than giving them an opportunity of purchasing the new dyestuffs directly from the manufacturers. It is only fair that the dyestuff manufacturers should realize that the mills are entitled to the fullest possible benefit of such developments as may be available."

DR. BERNARD C. HESSE, of the American Chemical Society, states that in 1913 Germany had 22 going concerns making coal-tar dyes and in that year exported 120,000 short tons of a declared export value of $51,640,000. In addition to this was 22,000 short tons of intermediates of a declared export value of $4,310,000.

"Among all the branches of the chemical industry of Germany," he continued, "the coal tar dye industry is the greatest of dividend-payers, paying 10 points more in dividends than any other branch; it sells its products in 33 countries outside of Germany and therefore has its eggs distributed among many different baskets.

"In any plans we may make for bringing about our independence of any foreign country for coal tar dyes, medicinals and other useful like products we must take all the facts and deductions into account and provide for them and their consequences, so far as we can reasonably forsee them.

"The Hill Bill and the Kitchin Bill were both introduced into Congress because of the insistance of dye-using interests that something be done to relieve the dye shortage, and not at the request of dye-makers. These same interests for 30 years had kept down the duty on dyes and were almost solely responsible for the disastrous tariff-cut of 1883; the dye-using interests, therefore, have almost complete control of the dye-tariff policy of this country, and the dye and chemical making interests have no such control—not even a reasonable hearing. Under these circumstances it is reasonably clear that the dye-using interests can have any duty that may now be added removed at their pleasure. It is not sound, national policy to attempt to build up an industry in this country by protective legislation, when the profits in that industry for some time will be dependent upon such protection, and then, have the power of altering that protective policy lodged exclusively in the hands of the customers of that industry, to be exercised at their pleasure and in their interests only.

"The Journal of Commerce of New York, on April 24, 1916, said: 'In the meantime dyes have been offered and sold here at fabulous prices in quantities palpably sufficient to keep all the largest textile plants moving. Somewhere and somehow supplies of dyes have been secured, for never before in the history of the United States textile industries, have plants been run so full, as they have been in the past six months, whether plants for printing, finishing or dyeing.'

"So, that, from about the end of October, 1915, there has been no scarcity of dyes—provided you paid the price. Is that a 'famine' or just a 'corner'?

"Had cotton not dropped violently in price in August, 1914, or, if manufacturers had then been willing to pay 15 cents for six-cent cotton, there would not have been any such prompt demand for dye-stuff-independence; we would probably not have heard much, if anything, about independence until fully a year later, if then. By so widely and

publicly using the dyestuff situation to offset the demoralized cotton market the cotton manufacturers simply invited others to come in and 'corner' the dyes, which seems to have been quite efficiently done.

"In now demanding that this country should never have been dependent upon others and that the dye shortage, famine or corner, should not have been permitted to exist, the dye-using interests are merely complaining against the logical, clearly forseeable, but deliberately ignored results of their own deliberate and concerted acts.

"To engage upon new business merely to relieve a famine, real or artificial, is not attractive to anyone; to enter upon it to establish it upon a sound, permanent basis is quite another thing. Frankly, all that the dye-using interests can safely be counted upon for, is to want to relieve the situation and they do not care how it is relieved—beyond that all is uncertainty, with the chances in favor of their successfully abandoning their desire for a strong domestic industry so soon as they can see reasonably clearly ahead for themselves—regardless of what the dye and chemical makers may think of the then existing conditions.

"Legislation to foster this industry can be no more lasting than the reason for its existence. None of the reasons so far discussed can truthfully be said to promise sufficiently long life to achieve that result. They have all been successfully used in the past to prevent such protection; they are now urged to create protection; there is no reason to believe that they will not revert to their former purpose at the very first opportunity, and that will no doubt come long before the industry is safely established.

"These reasons touch relatively few of us; the question of having at all times equipment in this country and men capable to operate it to produce means of national defense, i. e., high explosives, is one which promises to affect all of us. Now, what could a complete self-contained and self-sustaining domestic dye industry making our total requirements of dyes, so contribute? The most we could reasonably expect from it is that in a comparatively short time, say a month or less, it could turn out 100 tons high explosives per day and could train enough chemists, superintendents, foremen and workmen fast enough properly to operate additional high explosive-making plants as erected.

"The massed coast artillery of our Atlantic and Pacific seaboards has today such a capacity of firing projectiles that if 5 per cent of the weight of these projectiles were high explosive, 100 tons high explosive, or one assumed day's output, would last seven minutes; on the same basis, the high-explosive producing-capacity of the German coal-tar dye industry as it existed just before the war, would last 50 minutes, or perhaps an hour.

"Is it worth our while to have such a dormant capacity in this country?

"If the final answer to that question be an unequivocal 'yes,' and our army and naval officials are the only persons to answer that question in a way that would surely have the confidence of the public, then we have a reason for this special protective legislation that would be far more stable and far less subject to change than any other reason yet given; such legislation would not be repealed nor altered for trade reasons alone; it would not be repealed until the coal tar dye industry were really firmly established and we really did have this dormant capacity firmly under our own control. Surely we cannot be so impotent, as a people, that we cannot devise ways and means successfully to resist 'tariff-robbers' and prevent their exploiting us under this kind of a cloak!

"The future of the coal tar dye industry in this country depends upon what and why legislation is enacted. It is no time for half-hearted measures. Either we have the substantial whole of the industry or we will have nothing of value in time of stress.

"There is no reasonable question as to the wonderful expansion of coal tar and allied chemistry in the future. Fifty years ago no one would or could have dreamed of an industry of its present day magnitude—an industry that underlies so much of our textile, leather, printing, decorative and other industries; that is such a fundamental part of the great photographic industry that provides remedies and medicines that reach to every hospital and almost every sickbed in the civilized world, and adds to our comfort and well-being in such a multitude of directions as this industry does, and which also supplies so much and so many things to national defense. The best of these have not yet been discovered; there is much room for improvement. Just think of the advance in these lines during the past 20 years! Fifty, even 20, years from now this combined industry may have grown so that its present permeation of the industrial life of nations will appear as a dwarf by comparison with its then influence.

"Had we had a going dye industry in this country at the end of the 90s or early this century there is every reason to believe that we, too, would have been successful makers of the so-called vat-dyes that make the wonderfully fast modern shades, and would have had a substantial share in the making of all the other dyes and their intermediates and progenies.

"The longer we delay in getting this industry the more difficult the task will become. There is no question that we can, if we will, make just as good qualities as anyone; we cannot do it unless we have the opportunity to acquire the experience; shall we continue to be denied the opportunity or does the nation want these things and actually want them earnestly enough to face the situation and pay the price without quibble and without haggle.

"Great as has been our domestic progress in the past two years we cannot hope to keep it all without substantial economic help; to think that we will lose it all even without added help has no foundation in reason. Without help, and real help at that, we will continue to have, in normal times, an industry which is far from complete and self-sustaining and self-developing and bound to be a disappointment in times of stress and trial.

"In summary then, the coal tar dye industry of the present has grown from obscure beginnings of little real world-wide promise, to an industry that is of very wide ramifications in almost every phase of national and international commerce and industry; experience in the past has shown, that in order to get a foothold and develop in this country, it must be aided substantially; we have had only an assembling industry; at present, we have made great progress, much of which will remain with us, no matter if the present tariff be changed or not, but it will be in essence an assembling industry still. The future of the coal tar chemical and allied industries is brighter and fuller of promise than ever; its future in this country lies in our own hands, to make or to mar. Which will we do?"

The Condition of Italian Cotton Industry Since Beginning of European War

BY RAFFAELE SANSONE.

The Italian cotton industry, despite the great assistance given by the Italian Government in placing a very high importation duty on all manufactured and treated goods, was already suffering very considerably several years before the European conflagration owing to the very severe crisis prevailing all over the world, and of the 4,580,000 spindles installed in the different portions of the peninsula only four million could work, while the remainder had to be left unused partly through the closing of some of the works, partly through spontaneous reductions introduced by the industrials themselves, and partly through an arrangement made by the Institute Cotoniero Italiano.

This condition of affairs, already very serious in itself, became still worse when the European war was declared, and it reached the highest pitch during the month of August, 1914, owing to the uncertainty and confusion brought in every commercial and financial mechanism, and to the fear of being immediately drawn into the conflict. A very severe reduction in the production was the consequence, and the work in the majority of the Italian cotton mills was brought down to four days per week. The majority of these latter would not close entirely, and those who were compelled to do so did it through other reasons than the war; this avoided the great unemployment that would have followed. Moreover, as the families of those working in the majority of the Italian cotton districts were also engaged in agricultural pursuits, the work reduction was not so severely felt especially as it came when the working of the fields was necessary.

The favorable financial conditions, the improved functions of credit, the open ways of the sea, and above all the prolonged neutrality, assisted greatly towards improving little by little the conditions, permitting later a rapid recovery. This was assisted through a proper application of the decree prohibiting the exportation of cotton goods, that permitted the satisfying of urgent foreign needs, and through the military and naval authorities purchasing a great portion of the stocks, that for years had been accumulating and constituted a source of constant uneasiness to cotton manufacturers. All this increased little by little the work of the Italian spinning and weaving concerns and the prosperous times soon returned.

The quotations for raw cotton, that after the closing of the Liverpool and American markets had become very uncertain, encouraged certain American speculators to take advantage of the moment by overflowing the market with low offers; this encouraged many Italian cotton merchants and spinning and weaving concerns to place large orders and if all these are executed to the letter their profits will be high.

Since the entering of Italy side by side with England and her allies in the European conflict, the condition of the Italian cotton industry has been little altered, in fact improved, and this is not difficult to understand. The army and navy equipments being incomplete, and there being a more intense consumption of textiles, the mills are working extraordinary hours and cannot manage to satisfy all requests, so that the Italian government is obliged to seek supplies from abroad.

The labor employed in the cotton industry has also not been much affected by the state of war, for the 120,000 hands employed in this industry, three quarters are women or girls, and the small number of men called under the arms has already been replaced by others.

One of the only real difficulties encountered at present is the lack of dyestuffs, and many dyers have to return to the old-fashioned and troublesome natural colors, as those of artificial manufacture are becoming less and less every day, and are not to be purchased anywhere owing to the comparatively few works at present in a position to produce or export them.

The increase in the exportation of cotton goods was initiated principally in the first three months of 1915 and, as can be gathered from the following statistics, was very considerable when compared with what took place in the same period of the preceding year.

During January, February and March, 1915, cotton waste to a value of 3,477,180 lire was exported, against 1,176,230 lire in the preceding year; plain or grey cotton yarn to a value of 24,228,019 lire, against 7,261,239 lire in 1914; bleached cotton yarn, 523,113 lire, against 410,775 lire in 1914; two and more fold grey cotton yarn, 17,671,580 lire, against 1,504,862 lire in 1914; bleached doubled cotton yarns, 308,847 lire, against 226,419 lire in 1914; sewing cottons, 720,300 lire, against 202,650 lire in 1914; grey cotton fabrics, 5,841,207 lire, agains 4,371,448 lire in 1914; dyed cotton fabrics, 26,405,083 lire, against 19,801,165 lire in 1914; cotton velvets, 1,110,400 against 6,500 lire in 1914, etc.

The amount of raw cotton imported in Italy during 1914 was slightly below that of the preceding year, being of 310,512,200 lire against 334,731,682 lire in 1913. Four-sixths of this cotton came from the United States, one-sixth from India and the rest from Egypt and other countries; whereas three-fifths of the total importation of the same was shipped via Genova, one-fifth via Venice and the last fifth via Naples, Livorne and Ancona.

The number of the goods addressed to Germany and Austria was, before the entrance of Italy in the war, quite insignificant for the English warships and their forces stationed at Gibralter and in the Suez Canal did not allow the passage of any cotton coming from the United States or any other part of the world, that was destined to beligerents. At present delivery has ceased altogether owing to a recent royal decree that forbids the exportation of all goods destined to the central empires.

Other interesting decrees have been issued referring to the same question. Thus on the 4th of May, 1915, a special decree defined the right of seizing goods not claimed in the port of Genova as follows:

"All goods lying in the railway spaces or maritime docks of the port of Genova must be withdrawn within ten days from the above date. When this does not take place the railway administration will have the right of sending them in deposit at an internal station, advising those concerned and awaiting their further instructions.

"When there is no room in the port of Genova, or for other reasons, the railway administration will have the right of detaining in certain stations all goods that may be thought necessary. If after three months the goods have not yet been claimed or withdrawn they will be considered abandoned, and the railway administration, or the Consorizo Autonomo del Porto di Genova, will have the right to sell them. The period of three months can be reduced when the goods are liable to be spoilt during this period, or for other reasons."

The sales decided by this decree never took place, and even at present no cotton is sold by these authorities, the reason for which will be explained later.

Another very interesting and important decree was published on the 11th of June in the Italian Official Gazette, that established definitely a commission for the seizure of prizes. The result of which was the capture of several Austrian and German ships lying in port.

A certain quantity of cotton, to elude this vigilance and seizure system, will undoubtedly be imported just the same to Germany or Austria by Switzerland, and a rough idea of the extent to which a similar importation can take place is to be gathered from the following statistics:

From the 4th to the 19th of May, 1915, 10,702 tons of raw cotton were charged in the port of Genova, 7,697 tons being destined for the interior and 3,005 tons for exportation principally to Switzerland. From the 28th of May to the 24th of June, 22,690 tons of raw cotton were charged in the same port, 17,581 being destined for the interior and 4,109 tons for exportation also principally to Switzerland.

The stocks, and particularly those in the port of Genova reached very high figures during the first months of the war, as the number of cars for transporting the material destined to Italian manufacturers or merchants and to Switzerland, Germany and Austria was quite insufficient for keeping up with the arrivals.

The number of bales of raw cotton that entered this port during the month of August, 1914, reached 23,351, while those that entered in September, owing to the great panic and enormous delay in deliveries of all kinds, were reduced to only 6,244 bales. In October the number of the bales had a considerable increase, mounting to 32,119. Notable in this last month was the importation of raw cotton from Egypt that was ten times higher than in the two preceding months.

During the month of November the deliveries increased still further. Owing, however, to the lack of railway cars, the greater portion of the raw cotton could not be sent to destination, and during this month there was an accumulation of 60,000 bales. The Italian spinning and weaving concerns were thus deprived of their raw material and by the rapid decrease in the stocks saw themselves in the danger of a general closing. Some consider that this lack of cars was purposely created for stopping, or at least reducing deliveries across the frontier, especially owing to the probability of war with the central empires.

In December, 1914, the quantity of the raw cotton stored in the port of Genova was 115,000 bales. The great confusion and overcrowding a similar accumulation of material brought with it, especially as at the same time other goods came pouring in from every portion of the globe, was the cause of a serious fire. For avoiding the repetition of a similar calamity many of the cotton bales were stored in the open on the docks themselves, and in many cases either found their way into the sea, or by remaining continually exposed to bad weather accumulated water and dirt, bringing also the formation of mildew.

Owing to removal, the cotton goods accumulated during the last months of 1914 in the port of Genova have been much reduced, remaining constant at about 33,077 tons the value of which is calculated to be 46,307,300 lire.

The ships loaded with cotton that have to remain in port awaiting discharging are never very numerous. On the 15th of April, 1915, the ships waiting in port at Genova and in the ports of Vado, Spezia, S. Margherita and Oneglia were four, and contained between them about 11,000 tons of cotton, having an approximate value of 13,000,000 lire.

The stocks appear to have remained constant for the last month as the greater portion of the goods arriving, through the reorganization of the railway traffic, that seems to have been but little upset by the general mobilization that followed the entering of Italy in the field, have been charged and sent off at once. These stocks represent the goods available for sale and that appear to represent up to a certain extent those that have never been claimed and that in accordance with the royal decree of 4th of May, 1915, have simply been seized. Such goods are not, however, sold by auction as they are kept in case the supplies required for the national industry should fail.

Raw cotton imported into Italy during 1915 was 291,243 tons, against 190,632 tons in 1914, and 201,880 tons in 1913, being therefore in considerable increase in 1915 over the two preceding years; showing clearly the great intensity of the work created through army demands and especially through the manufacture of cotton clothing for the soldiers.

Nineteen hundred and fifteen showed an important increase in the importations of raw cotton from the United States. These, although they had been reduced from 148,338 tons in 1913 to 126,027 tons in 1914, rose in 1915 to 214,799 tons. The amount of raw cotton imported from India to Italy was 60,149 tons in 1915, against 49,633 tons in 1914, and 35,225 tons in 1913; whereas that imported from Egypt reached 15,488 tons in 1915, against 10,090 tons in 1914, and 148,338 tons in 1913. Raw cotton imports from other countries were to the contrary greatly decreased, as these did not possess sufficient ships or means for supporting the ordeal of the war, or did not dare to risk the unsafe condition of the seas.

The grey cotton yarn goods imported during 1915 were more than double those imported in 1914 and 1913; the increase taking place, as can be seen from the following table where all figures indicate Italian tons (each of which is equal to 2,204.6 American pounds), principally in the case of English goods and of goods coming from other countries than Germany, and amongst which figured undoubtedly the United States. Imports from Germany, that during 1914 had dwindled considerably, were reduced in 1915 to next to nothing.

	1915	1914	1913
Germany	2.7 tons.	16.7 tons.	36.6 tons.
Great Britain	316.3 tons.	87.2 tons.	113.0 tons.
Switzerland	3.9 tons.	4.7 tons.	35.4 tons.
Other countries	177.1 tons.	98.7 tons.	53.0 tons.
	500 tons.	207.3 tons.	238.0 tons.

Bleached yarns imported during 1915 were 56.8 tons against 40.5 tons in 1914 and 77.9 tons in 1913, showing a great decrease over this last year and a fair increase over the preceding year (1914). Dyed yarns imported during 1915 were 137.5 tons against 337.2 tons for 1914 and 332.1 tons for 1913.

In the importation of grey cotton fabrics there was a considerable increase in 1915, and this amounted to 643.6 tons against 392.4 tons in 1914 and 355.8 tons in 1913. Bleached cotton cloth was imported for 231.5 tons in 1915, against 351.2 tons in 1914 and 338.5 tons in 1913; there being therefore a fair decrease in the imports of such goods due to the war.

Dyed cloth goods, owing to the lack of coloring matters, could only be imported in reduced quantities during 1915, although the same were urgently needed, and this is shown very clearly from the most recent statistics, that show an import of 443.5 tons of dyed fabrics against one of 892 tons for 1914 and one of 776 tons of 1913. As will be seen during 1914 Italy increased somewhat its importation of colored goods, the increase was however of little benefit for 1915, owing to the urgent need of such goods and to the difficulty of obtaining them abroad.

The imports of printed goods also received a marked decrease during 1915, being only 250.1 tons against 498.5 tons in 1914 and 523.7 tons in 1913.

Since 1915 and during the first six months of this year the Italian imports appear to be decreasing in some cases, while in others they are slightly increasing. No sure statistics are, however, yet available, and none will be till about the beginning of next year.

One thing is however evident and this is that Italy is at present in great need, not only of army cloth, but also of all other classes of cloth; and is also in need of cotton yarn of all classes. Those who can supply such goods at present, or as long as the war lasts, can do this under such extremely favorable conditions as will never be repeated in the future, when it will no longer be possible to obtain cash guarantees before even delivering the goods as is at present possible, and the good prices at present prevailing.

The Italian exports of cotton goods are much more considerable than many may think and these are represented by the most varied classes of goods as many Italian manufacturers prefer foreign markets to their own.

Raw cotton exported in 1915, showed a marked decrease since the war; while the exportation of cotton waste does not seem to have suffered much through the war as 7,446 tons of this product was exported in 1915, against 8,858 tons in 1914, and 8,933 tons in 1913.

Some further interesting information can be gathered from the following statistics: Grey, bleached and dyed cotton yarn was exported during 1915 to the amount of 27,005 tons, against 14,167 tons in 1914, and 14,357 tons in 1913, showing quite clearly that although the European war had slightly reduced the Italian yarn exports in 1914 it was undoubtedly a great benefit to them in 1915 for it increased them considerably during this last year.

The Italian exports for grey, bleached and dyed cotton fabrics were also increased during 1915 as compared with 1914 and 1913, there being 32,720 tons in the first case, 22,427 tons in the second case and 30,381 tons in the third case.

Printed goods exported was 5,137 tons in 1915, 4,657 tons in 1914 and 6,986 tons in 1913. No reliable statistics are available for Italian exports since the end of 1915.

A Starch Acetate.

The increasing scarcity of ocean freight accommodations, and the great demand for food products in foreign countries, has caused a tremendous shortage in the market of imported starches, tapioca, etc., and the consequent high prices of all products made from them. Many of the sizings preferred by the finishers are made from these imported raw materials. It would seem, therefore, that they would now find it more convenient to turn their attention to products "Made in America" from American-produced raw materials. The Feculose Company of America is manufacturing such articles at its modern plant at Ayer, Massachusetts.

Feculose has the same relation to starch that artificial silk has to cellulose. It is a starch acetate, and its properties combine those of felatine and dextrine. It is a fine, dry, white powder, having neither color nor odor when cooked. It greatly increases the strength of the material on which it is used. By the use of softeners, glucose, etc., with Feculose, results can be obtained to satisfy the requirements of the most difficult work.

The Feculose Company's plant has ample facilities for the manufacture of large quantities; it is now running day and night, and plans are being made to increase its capacity. The plant is in charge of a corps of expert chemists. Manager John Traquair (who is also vice-president of the company), is a chemist of international reputation, and one of the better known starch chemists of the country, a specialist of many years' experience. Therefore the Feculose Company of America offers the use of expert knowledge in all the details of the business to interested manufacturers and finishers.

The Alexandria Cotton Co., Ltd., make the following report on the forthcoming Egyptian cotton crop under date of August eighteenth:

The consequences of the delayed water rotations, also of the prolonged high temperature, are becoming noticeable over the Delta. The growth of the plants has been pushed on too quickly with the result that the flowering and bolling were hastened too much and are in general rather unsatisfactory. In many plantations the bolls are of a smaller size than previous years and in some cases not so numerous. This may prove an important factor in the final result of the yield of the crop, but everything depends on later developments.

The Blue and Black Niles are rising rapidly and this has brought an abundance of water in the higher reaches of the Main Nile where all the nilometres are above normal. It is very likely that this increase will continue and rotations will be modified for the better, but the increased supply will not come in time as far as the cotton crop is concerned.

No new attacks of the cotton worm are reported—also nothing much to be said about the pink boll worm. From Simbellawen an attack of locusts is reported, but the damage was not serious.

Mill Conditions and Market Reviews.

Southern Mill Situation.

As this is being written, the prospect of a big railroad strike seems imminent. It has been believed by many people that such a strike and on the scale indicated, would be an impossibility in this country. Advices, public and private, seem to indicate that not only may such a strike occur, but its likelihood is becoming more and more of a certainty.

Several peculiar situations have thus far arisen out of this strike controversy. It seems as if a large part of the 90 per cent of railroad operatives who are not striking are of the opinion that both sides are to blame. As one employee pithily expressed it, "The railroads have coddled the engineers and conductors and have given them everything they wanted in the past to the injury of other workers, until now these classes feel that they can run things to suit themselves and are trying to take the law into their own hands."

Another feature that has been emphasized is the fact that there is no means for enforcing arbitration on the part of the men, although the railroad officials are perfectly willing to have their difficulties arbitrated by the Interstate Commerce Commission or others.

While it is well understood that labor and capital should each be protected in its rights, the general public has even more rights on the broad ground that the whole is greater than any part thereof and should also be protected. It is protected in so far as the railroads are concerned by the Government through the Interstate Commerce Commission. It is not protected from the effects of labor disturbances, because labor unions are not incorporated bodies and are not subject to Federal control. This has been pointed out in the columns of COTTON many times, but Congress, being bound in the fetters of vote getting servitude, has up to the present taken no action.

It is sincerely hoped that some method will be adopted for avoiding this labor difficulty on the railroads, inasmuch as it would be a woefully serious matter for many people and many businesses.

Another feature of the month has been the passage of the Keating-Owen Child Labor Bill. An analysis of this bill and its results to mill men as given by a correspondent in *Commerce and Finance* under date of August 16th presents a rather clear view of this situation, and it is reproduced herewith practically verbatim.

"Much has been written and said regarding child labor in the Southern cotton mills and much of this has been to the discredit of the mill owner and operator, the role most frequently assigned him being that of a conscienceless slave-driver wringing large dividends out of the blood and tears of thousands of worn and emaciated beings beneath the age of fourteen, children in years from whose lives all the joy, gladness and spontaneity of children has been banished forever by ceasless toil in close, unhealthy buildings, breathing air laden with tuberculosis-producing particles of fibre mingled with the fetid breath of hundreds of other hapless children.

To persons whose ideas are derived from accounts such as described above the Owen-Keating Bill is a very belated reform measure which will free the enslaved children in the Southern mills as Alexander II freed the serfs of Russia at one stroke, and all opposition to it is regarded as the inevitable cry of entrenched capital when anything is suggested having a tendency to reduce dividends. To these persons it would be no little surprise to learn that these same grasping, child-bruising mill men are in many instances infinitely better sociologists and uplift workers than the half-baked so-called reformers who are so constantly breaking into print with their startling revelations of awful conditions. A few minutes connected and logical thought will convince any one that the well being of the cotton mill operatives of the South is as essential to the success and prosperity of this great industry as any factor entering into the manufacture and marketing of its products. The situation is very different in New England where there is a continual influx of immigrants from which textile operatives may be constantly recruited. In the South there is no such supply to draw from and the present presumption is that its mills a generation hence will be operated in the most part by the children and grandchildren of those thus employed at present.

"Already we have in the older Southern textile centers instances of three and even four generations of one family who have worked in the same community and sometimes in the same mill and with the growing diversification of equipment and products and the demand for specialized skilled labor with its accompanying opportunity for advancement there is no field of employment which offers more to the average young workingman than cotton mill work. Knowing to a moral certainty that the names on his pay-roll twenty years hence will be largely those of the children now in his mill village the mill man would be adopting a very short-sighted policy and doing himself and his stockholders a most irreparable injury if he failed to safeguard, as far as possible, the health, happiness and well being of these children. It is therefore only natural that this interest manifests itself in innumerable ways every day and from practical experience the mill man becomes an adept in the art of thinking, planning and doing for his people, in many instances performing the functions and duties of their legal, medical and moral adviser, loan banker (not with usurious interest as in some industries but frequently with no interest at all), and, in a word, taking the place of their friend and elder brother.

"It would be futile to deny that child labor in its generally accepted sense has flourished to a certain extent in Southern cotton mills just as it has in the cranberry marshes of New England and in the canneries, fisheries, mines and other industries all over the country. It is also true that during the past decade labor laws continuously and progressively favorable to children have been adopted in the Southern states until today, with the possible exception of a few details, the labor laws are, in the opinion of those having the greatest experience and consequently best qualified to judge, adequate for the protection of the child from labor which will cause physical, mental or moral deterioration. Since this much has been done by the states in a comparatively short time and since the mills themselves have without the pressure of any law continually improved the sanitary, hygienic, educational and social conditions of their operatives, it is considered unnecessary to place a law of this kind upon the Federal statute books. The value of training children to skill, obedience and a sense of responsibility through contributing their earnings to the family envelope, is largely

lost sgiht of and, conversely, the deplorable effects of enforced idleness without proper supervision or control are not taken into consideration by the advocates of the bill. The opposition to the bill has been grossly misinterpreted. The age limit of fourteen is little, if any, higher than that now in force in the South and its observance will work no great hardship upon the mills. The chief opposition centers about the eight-hour restriction for children between fourteen and sixteen, this being apparently the entering wedge of the labor agitators for a universal eight-hour law and as such it is recognized and vigorously opposed. The other cause of opposition is that the bill takes out of the power of the state the handling of its own peculiar domestic problems with which outsiders are unfamiliar and is thus an instance of flagrant transgression of states' rights."

The facts regarding the cargo of dyestuffs received on the submarine "Deutschland" appear to be these: The dyestuffs portion of the cargo consisted of three thousand and forty-two (3042) packages, which totaled less than two hundred (200) tons. The value of the cargo is not known. The forwarding company was free to secure a price which would bring them out whole on the venture. The freight, therefore, was undoubtedly an extraordinary one. The goods themselves were from six producers in Germany and were intended for their respective distributors in this country, viz: The Bayer Company, The Badische Company, Cassella Color Company, The Hoechst Company, Berlin Aniline Works and the Kalle Color and Chemical Company. If these American concerns had been unwilling to pay the price demanded by the forwarding company then the allotment would have been placed on the open market. It is understood that the six concerns have each taken the portion intended for them respectively. While the importation is not large it is understood to have included numerous types of which the American market has been bare for over a year and it will prove of vast relief in many quarters hard-pressed for these German specialties.

The plant of the Valley Creek Cotton Mills, which has been closed for more than two years, has been taken over by the Raybell Manufacturing Co., incorporated, with capital stock of $60,000. The officials of the company are: President, W. T. Bell, Greenwich, Conn.; vice president, W. B. Craig, Selma; secretary and treasurer, F. H. Elmore, Montgomery, Ala. G. Henry Jones of South Carolina will be in charge of the mill at Selma, Ala.

Plans and specifications have been completed for the Yadkin Bleaching Co.'s proposed plant at Salisbury, N. C. The main building will be 300 x 100 feet and three stories high. Its equipment will include machinery for bleaching, mercerizing and otherwise finishing high-class cotton products, the building and machinery being reported as to cost $200,000. Electric and water plants will be provided for the mill.

It is reported that the Henry River Manufacturing Co., Hilderbran, N. C., whose plant was damaged in the recent floods, will build a new mill which will be three stories high, 150 x 75 feet, to be equipped with 8,000 spindles and accompanying machinery.

Definite plans have been announced for a cotton mill and village to be built by the Hamilton Carhartt Cotton Mills, Rock Hill, S. C., recently mentioned as to build an addition. This new plant will be three units, to be completed within two years, contracts having been awarded for the first $100,000 unit. The main building will be 2½ stories, of brick construction on piers of rubble stone, with brick panels and large section of steel sash and a green tile roof. It will be equipped with 3600 spindles and the accompanying preparatory machinery, 116 looms and a dyehouse to dye long chain and raw stock, the weekly capacity to be 36,000 yards of cloth. The mill village will have three to six-room cottages, containing bathrooms, electric lighting, water and sewer facilities.

A $300,000 cotton cordage mill is to be built at Newport News, Va. The amount named is the estimated cost of the buildings, machinery, etc., including the electric power drive. The electricity may be obtained from Newport News, Hampton & Old Point Railway Co. A. L. Powell, president of the Powell Trust Co., and associates are understood to be financing the proposition.

The Pelham (Ga.) Mfg. Co., will install 300 looms, replacing old style looms.

The Haynes Mills, incorporated, with a capitalization of $300,000, will have 10,000 mule spindles and 300 looms, and will be located at Avondale, near Henrietta, N. C. R. R. Haynes of Cliffside, N. C., is president, and Z. O. Jenkins of Henrietta is treasurer.

Machinery is being installed at the Columbus (Ga.) Manufacturing Co.'s plant for the purpose of increasing the output of the mill. The new equipment includes 246 Draper looms.

A 300-foot addition and an installation of 5000 spindles, with accompanying equipment, are planned by the Jewel Cotton Mills of Thomasville, N. C.

The Indian Head Mills, Cordova, Ala., previously mentioned as preparing to make some changes in their mill buildings, have let a contract for rearranging their main mill and for the erection of a reinforced concrete opening room. Lockwood, Greene & Co., of Boston and Atlanta, are the architect-engineers.

The Georgia Cordage Mills, Scottdale, Ga., will be reorganized under the name of the Georgia Duck and Cordage Co., and will have a capital stock of $60,000. Their previous charter was dissolved. The mill has been manufacturing yarn and twine, but will install looms for the manufacture of duck.

The contract for the new cotton storage warehouse for the Chinnabee Cotton Mill of Talladega, Ala., was started recently. The building will be 150 x 75 feet.

The Abington Mills, Huntsville, Ala., are installing 10,608 spindles, 236 looms and 48 cards, with accompanying machinery. When this addition is completed the mill will have 111 cards, 25,448 spindles, and 516 looms. They manufacture high class duck.

The Cross Cotton Mills Company, of Marion, N. C., has received a charter with $150,000 capital authorized and $35,000 subscribed by Eugene Cross, D. E. Hewgins, A. R. Conlet and A. J. Farley for general cotton milling business. Eugene Cross is at present superintendent of the Taylorsville (N. C.) Cotton Mills.

The Cannon Mills, Kannapolis, N. C., have let a contract for 120 new houses and it is reported that construction on a mill to be known as mill No. 5, will begin early in 1917.

The date for the fall meeting of the Southern Textile Association has been set for November 24th and 25th, and it will be held at Columbia, S. C.

New England Mill Situation.

A great abundance of business is being tendered to the mills and prices have gone up steadily for the month. The advances in print cloths, bleached cottons, many fine yarn goods, and wide sheetings that were predicted a month ago as a consequence of additional fall buying, were stimulated also by the strength of the cotton markets. Values are on a very high level but producing costs are abnormally high without any immediate indication of a recession. If they do not mount still higher while the war goes on the estimates of some manufacturers will miscarry.

Last year, in August at about this time, the 39 inch 68 x 72's could hardly be sold at 4¼ cents and are now bringing 6⅞ cents; the 60 x 48's that were at 4¼ are at 5⅛ cents; the 64 x 60's that were 3⅝ cents are at 6⅛; the 30 inch combed lawns that were at 5 cents are now difficult to be had at 7½ cents; the 31 inch bag goods that sold at 3¼ cents are bringing 5½ cents; and so on through a great list of expanded values affecting mill prices only. When it is remembered that this expansion in mill prices is being greatly amplified above normal in printing and finishing costs, and in all lines of textiles outside of cottons, it will be understool readily that capital is being tied up in various channels and may not be quite as plentiful in future as it has been for the use of traders.

This is one of the features of the present situation that is attracting serious attention among those manufacturers who are also bankers and who in addition to buying mill paper also purchase considerable miscellaneous mercantile paper. There is throughout this whole section a feeling that while the present prosperity is real enough, and bids fair to last for many months to come, it is after all, a dangerous sort of a business in view of the ever present opportunity for financial shocks at home and abroad while war is the underlying influence.

An annoying interruption in the shipment of goods sold for export has resulted from the operation of the new policies of the Allies in dealing with their enemies. The so-called British blacklist is an endless chain in its operation, for while a great many goods hitherto sold to South American countries and financed through London, were entirely innocent so far as domestic houses were concerned, they cannot be shipped in British Bottoms and will not be taken by other than British vessels that have to touch for coal at British ports and thus become subject to the favor of British treatment. It is promised that the goods from this country not intended in any way for the enemies of Great Britain will not be interfered with when the working out of the new plans has been fully arranged. But at one time a single New York house had over $200,000 worth of cotton goods held up either in New York or mill storehouses awaiting the unrolling of a deal of red tape that is clogging the export movement.

That considerable export business is being discouraged because of the many new troubles that are placed in the way of shipping companies is not doubted, and while a decline in export trade may be ultimately attributed to high prices, it will be found that one other explanation will be that it is too hard to ship goods abroad to interest traders who have plenty of business at home.

The importance of the new export trade in cotton goods is being fully appreciated in New England. Less attention has been paid to it than to any new development of the war business, but some phases of it are pretty well understood. For example, the staple printers are shipping fully a fifth of their output abroad. Two of the largest hosiery mills have so much foreign business offered at their own figures that they are quite independent of the single domestic market. Two of the large bleacheries are finishing at least a sixth of their output constantly for export. These are only random cases showing that steady progress in exports is on.

Occasional strikes are taking place in different mill centers but on the whole the labor conditions are as good as manufacturers hope for during the favorable outdoor season. There is considerable machinery idle because of a scarcity of labor, in some instances mills having as many as 300 looms idle. The greatest difficulty complained of is in finding help for dye and bleach houses, mill yards, and wherever the commonest kinds of workmen are employed. This is explained by the ease with which laboring men can find profitable work on the highways, in the building and ammunition trades, and in laboring work in machine shops.

The markets have been growing stronger despite price advances, and orders in hand insure full operations for at least four months. There are mills whose orders will carry them well into next year. The activity in print cloths and convertibles resulted in an advance in staple wide 64 x 60's from 5¾ cents to 6⅛ cents. Other goods went up correspondingly. There has been a large business placed on fine drills, twills, coutils, and other specialties for the converting and manufacturing trades. The tire fabric trade has been very active and many large contracts are booked to run through the first half of next year.

Fall River sold print cloths more freely in the first weeks of August than for a long time, both spot and contract sales running in excess of the weekly output by a half, two or three weeks in succession. Stocks at that center are the lowest known since the late months of 1906.

About the middle of the month it was announced by B. B. & R. Knight that Fruit of the Loom 4-4 bleached cottons were to be advanced to 10 cents from 9½ cents and the new price is guaranteed against a decline up to November 15. Soon afterward other lines of bleached cottons were marked up in the same ratio. The guaranteeing of the new price on Fruits was unusual although not considered risky in view of the strong situation in general lines. It stimulated forward purchases at the highest price that has prevailed since 1907.

The bleacheries are still not turning out goods to their capacity although orders in hand are sufficient to provide work for an average of 60 days ahead. More bleached goods have been made and sold in the first seven months of this year than ever before in the history of the New England trade but there is nothing to show any sign of a declining demand.

Colored goods mills are very well employed but advance orders are being placed with more caution. The dress gingham mills booked from 75 to 80 per cent of a full business for spring and are quite content with that ratio in view of the very high prices over those of a year ago. The staple gingham trade has not been as good as the low end of dress ginghams, the new price of 8 cents a yard for staples being considered pretty high by the buyers. The finishers of

colored goods, particularly piece dyes, have been tendered more work for spring than was the case a year ago. The trade appears to have grown accustomed to the very high prices asked for dyeing poplins, gabardines, and oxford weaves, and consumers are taking more goods of late.

The dye situation continues to attract less interest than it did a year ago, for the reason that manufacturers feel themselves to be helpless against the extraordinary prices that are exacted for imported or domestic colors. So long as consumers will go on paying the prices now asked for colored goods, the dyers are willing to go on paying the high prices for dyes. Less hope is entertained now than a month ago of getting a favorable bill through Congress to stimulate the investment of domestic capital in the dye making business.

Trade in fine and fancy goods with the mills has been satisfactory. Additional spring orders have been booked on voiles, poplins, skirting fancies, lawns, and organdies. The last named cloths are being called for in plain and fancy weaves in quantities larger than mills care to accept on contract, the chief difficulty being the one of spinning the very fine yarns called for.

While the fine combed yarn cloth mills have been making a great deal of profit, the higher cost of staple cotton is becoming a most serious factor in the new spring business. Some mills are entirely out of cotton above inch and a quarter staple and do not care to pay the fancy prices asked for additional supplies. They are able to get plenty of business on yarns under 100's and do not care to buy cotton for the choice fine numbers even though very unusual prices are offered for the goods.

Leading manufacturers of quilts and towels are fully employed with contracts booked in some instances for deliveries carrying into March and April. The production of crochet quilts is the largest ever known but there is also a very good output of satin quilts being taken. Many foreign orders have been tendered recently, particularly for special crested goods to be used on steamship lines, foreign hotels, etc. Some of this business is being taken, but as a rule the mills are too busy to handle it.

The New England cotton yarn business is in an unprecedented condition. A number of leading mills have ceased to quote for any delivery this year for either weaving or knitting purposes. The finer qualities of mule spun carded yarns are virtually off the market, only a few of the larger customers being able to receive consideration at any price.

One of the spinners who has supplied certain of the large men's wear mills for some years with particular grades of weaving yarns in warps has been offered business for delivery from January to July at the highest prices ever suggested for cotton yarn by one of the oldest and most experienced buyers. The explanation given is that unless something unexpected intervenes, wool and worsted yarns are going to prohibitive levels next year and the rush to get the best qualities of special warps for men's wear will be uncontrollable. In any event, the price the buyer for this large mill offered to pay for a contract in excess of a million pounds was more than double the price he could have bought for one year ago.

It is sometimes easy to step into another man's shoes, but to cover ground in them ofttimes proves difficult.

Lancashire Notes.

BY AN ENGLISH CORRESPONDENT.

The thoughts of spinners and manufacturers are turning to the cotton crop and the share of it that is likely to fall to Britain. The question is not a new one and for several years past the difficulty has not been the finding of markets, but of obtaining a sufficient quantity of the raw material to fulfil orders and keep machinery running. As is well known, it was the increasing demand upon the cotton crop from buyers in various parts of the world, that was mainly responsible for the formation of the British Cotton Growing Association. The main factor in the situation is the increasing share which America takes of her own crop. It is estimated that the American crop this year will be 14,000,000 bales, and that of these America herself will take half. For several years past the proportion of the crop which has fallen to Britain has been growing less, and there is a very prevalent feeling among leading cotton men that unless something is done to meet the situation the Lancashire industry will be faced with a grave crisis in the near future. The tendency of things was bad enough before the war, but as a result of the fall in prices on the outbreak of hostilities, the acreage under cotton was so decreased that the position not very far ahead promises to be something like desperate. J. Arthur Hutton puts the decrease in acreage planted with cotton in America at about 15 per cent and in Egypt and India at about 30 per cent, and he speaks of ruin facing the Lancashire trade unless prompt steps are taken to increase the supply of raw material. He looks to the British Cotton Growing Association, of which he is chairman, to meet the deficiency, but his view is that it is altogether too big a matter to be left in private hands, and that the only way out is through generous support and energetic action on the part of the government.

The supply of raw material is especially important in view of the fact that Lancashire manufacturers hope to extend their trade by invading markets dominated before the war by Germany and Austria. I wrote last month of the government committee which was inquiring into the condition of the trade, especially in its international aspect. The government is also fostering a movement for capturing enemy trade by means of exhibitions. One such exhibition has been held in Manchester, in the textile section of which were several thousand samples of enemy goods which had been sold in 38 markets. Attached to the samples was such information as commercial men would need in order to judge of the possibilities of effective competition, and already some firms are trying their hands at the new lines. The goods, for the most part, are of a very cheap class which British manufacturers have hitherto ignored, but with which their German and Austrian competitors have built up a big and profitable trade. The textile samples included suitings, coatings, cotton prints, tweeds, tea-cloths, hose, neckties and underwear. They were outwardly very attractive, and although cheap, the quality was, in some cases, remarkably good for the price asked. Nevertheless, the analysis of some samples showed to what a considerable extent our Continental competitors have developed the art of adulteration.

Women have now entered many mill occupations from which formerly they were barred, but there has been nothing

like the influx which would be necessary to relieve firms of all the difficulties and anxieties occasioned by the calling of men to the colors. Little has been done in the way of definite re-organization beyond local agreements providing for the introduction into the mule-rooms of female piecers. In individual mills, however, women are engaged on work which has never before been placed in their hands. In the blowing-room they can now be found employed at mixing, opening and spreading, and assisting at waste-breakers and scutchers. In the card-room they are working as tenters to Derby doublers or condensers. In the ring-spinning room they can be found doing the work of banders and jobbers, and in the weaving section undertaking beaming, ball-warping for light warps, and the work of drawers and twisters. The shortage of weavers in some centers, however, is considerable, and hundreds of looms are stopped for lack of them. Work in the warehouses is considerably hampered by lack of men, but women are, to some extent, making up the deficiency. They are, for example, working in some mills as cop-packers, but many employers complain that their work in that capacity is not efficient. It is very doubtful whether sufficient women can be obtained. Women can nowadays obtain in other occupations better wages than are offered in the cotton trade, and many find tram-conducting, letter-carrying and other less mechanical and monotonous employments more attractive.

With those other sections of the textile trade, cotton men are watching the developments of the government-aided attempt to make this country independent of foreign dyes. The latest departure has been taken by the Manchester City Council, which has established at the School of Technology a new sub-department for post-graduate study and research in coal-tar products and dyestuffs. The council has been fortunate in securing Professor A. G. Green, the discoverer of primuline, dianthine and other important dyes, to take charge of the new department. Professor Green has first-class knowledge of the manufacture of dyestuffs, and recently resigned the chair of tinctorial chemistry at Leeds University in order to direct the research department of a big dye-stuff manufactory. The new department will be under the general supervision of Professor Knecht, who has charge of the applied chemistry department of the school and is an expert in the use of dyestuffs.

The hard waste weavers and the velvet weavers are demanding a ten per cent advance in wages, and in both cases a dead-lock seems likely to ensue.

Cotton Comment.

BY H. AND B. BEER.

New Orleans, August 19th, 1916.

The sensationally bullish figures issued by Secretary Hester of the New Orleans Cotton Exchange, showing consumption by the world of American cotton the past season, 14,812,000 bales, coupled with unsatisfactory crop advices from the interior, are reflected in a further advance of more than one cent per pound in the price of cotton compared with one month ago, the present quotation, 14.13 cents per pound, basis of middling, being the highest for this period of the year for many years past. (As this section of COTTON goes to press a gain of over another cent a pound has been registered.—Ed.)

Of late the weather has been more favorable for the growing crop in the central and eastern portions of the belt, and some improvement is noted in these localities, but west of the Mississippi River climatic conditions were generally unfavorable; the drouth continuing in Oklahoma, and with insufficient rain in Texas.

On August 1st, the government reported the average condition of the crop on July 25th 72.3, which was the lowest August bureau report, with the exception of 1909, in 46 years. This created a more bullish sentiment in the market, and when the sensational figures on consumption of American by the world last season were issued on the 3rd inst., the market worked higher by leaps and bounds.

The August 1st government crop report indicated a yield, exclusive of linters, of only 12,916,000 bales, which, including linters, pointed to a total crop of only about 14,000,000 bales for this season, whereas, since last season's consumption was nearly 15,000,000 including linters, the conclusion was reached that there was the possibility of a famine in cotton and cotton goods before next July.

It is not surprising, therefore, that market advanced so rapidly from the already high levels, and unless crop conditions improve, higher prices are likely eventually.

However, there is the fear that when the movement of the crop becomes heavy, lower prices may be witnessed during the fall, as farmers are likely to sell freely while prices are high.

Nevertheless, there is danger on the short side of the market because of the crop being late, particularly in the eastern half of the belt, which makes it susceptible to considerable damage in event of an early killing frost.

By reason of the world's visible and invisible supply being reduced to normal proportions, on July 31st, 3,635,000, last year 5,629,000, of which mills in Europe hold only 700,000 vs 1,200,000, an urgent demand for domestic and foreign requirements is anticipated during September and October and throughout the season.

Last season Europe consumed 7,760,000 bales of American cotton, the United States 7,052,000. This season Europe will probably need about 8,000,000 bales, the United States perhaps 7,500,000, or a total for the world of possibly 15,500,000 bales. In this lies the strength of the situation so far as eventualities are concerned, present indications pointing to an inadequate supply to meet the probable demand of the world this season.

The cotton goods markets are strong and active, further advances having been recorded this week, with spinners unable to furnish goods fast enough for prompt shipment, being booked full for months ahead because of the increasing export demand in America, made possible by the European war.

During the season of 1909-10 the average price of middling cotton for the season was 14.60, and chances are that the average price of this season will be higher. Under the circumstances it would seem advisable for spinners to buy for future requirements on all important reactions, as abnormally high prices are likely after the new year. Sentiment is very bullish, but the speculative long interest is not large, and the public may enter the market, the high levels notwithstanding.

Nerve, bluster and pull will often push a man temporarily ahead of his fellows, but it takes brains to stay there.

The Yarn Market.

The yarn market for the past month has steadily maintained its gradual upward trend, and while the unusual prices being received robs the market of snap, so noticeable in normal times, still, the business being done is entirely satisfactory and many mills are sold up for months ahead.

During the latter part of June, there was considerable talk that there would be a break in yarn prices in September or October, but the floods in the Carolinas and its effect on the mills, the transportation and the cotton crop has probably settled this question of a break in yarn prices for several months at least. Not only are southern mills very well employed, but New England yarn mills are in a like condition, and it seems doubtful if this condition will be changed in the near future.

Early in the month there were many inquiries for combed yarn for delivery, starting any time from November 1916, to January 1917. The inquiries were for both single and 2-ply, and sales of 10,000 to 100,000 pounds were made for future deliveries. There were many inquiries for combed lisle and mercerized yarn for prompt deliveries in the Philadelphia market, and the knitters sold small lots through brokers of numbers they were not using at stiff advances over what they had paid a short time ago. For instances, 80's 2-ply combed peeler mercerized sold for $1.20 for delivery beginning in January, and $1.25 to $1.28 for prompt delivery. About this time a broker sold the same yarn to a knitter at $1.37 for spot delivery. Prices of carded yarns on cones were firm during this period and some numbers were scarce for quick deliveries. Weaving yarns were in light demand, but there was no softening of the prices; in fact, spinners' prices were if anything, a little higher.

A report from the New York market says it is believed that quite a few knitters have waited too long before covering their forward contracts and have overstaid their market. When 10's frame cones were offered in this market around 23 cents a pound, it was difficult to interest buyers, although they admitted that yarns were needed. Early in August spots were offered in New York at 24¼ cents, in some quarters and 24½ cents in others. Some spinners claimed to have put through sales at 25 cents, and many mills are asking 26 cents for good, clean, white stock.

The continued demand for combed yarn later in the month was a feature of the market. Mills that are not yet completed are sold up for months ahead, it is said. Prices of combed Sea Island mercerized are so high that ornamental braid manufacturers and embroiderers are substituting 36's 2-ply combed peeler with 16 turns reverse twist and 40's 2-ply combed peeler with 18 turns reverse twist in its place.

Hosiery and underwear manufacturers seem to be hard up for yarn for immediate use, and dealers are receiving many inquiries for all numbers up to 30's for quick shipment. Delayed delivery from spinners and neglect of knitters to fully cover their needs are given as the reason for this condition. Some factors seem to think that it is very doubtful if carded yarn on cones is as scarce as it appears to be. One dealer intimated that he could get what he considered a generous shipment if he would pay an exhorbitant price or about 26½ cents basis of 10's. A Southern spinner is reported to have sent word to several dealers that he had about 75,000 pounds of 12's to 30's Southern frame spun carded cones in stock that he would sell on the basis of 25 cents for 10's. It is said this amount was quickly taken at the spinners' prices.

Carded weaving yarns continue to move slowly, the weavers seeming not anxious to buy at present prices. Following are recent quotations:

Southern Single Skeins.

4s to 8s	22 @23½	10s	24
12s	25	14s	24 @25
16s	25	20s	26
24s	27½	26s	28½
30s	32	40s	41

Southern Single Warps.

6s	22½	10s	23½
12s	24½	14s	25½
16s	26	20s	27
24s	28	26s	28½
30s	31½	40s	40½

Carpet and Upholstery Yarns in Skeins.

8-4 slack	22½ @23	9-4slack	22 @22½
8-3-4 hard twist	22		

Southern Two-Ply Skeins.

4s to 8s	22	10s	23½
12s	25	14s	25½
16s	26½	20s	26½ @28½
24s	32	26s	32½
30s	33½	40s	44½

Southern Two-Ply Warps.

8s	22½	10s	24
12s	25	16s	25½
16s	27	20s	27½ @28½
24s	32	26s	32½
30s	33½	40s	42 @44½

Northern Two-Ply Carded Peeler Skeins.

12s	29 @31	16s	31 @32
20s	34 @35	24s	36 @38
26s	37 @38	30s	40 @42
36s	45 @46	40s	50 @51

Two-Ply Combed Peeler Skeins.

10s	35½	12s	36½
14s	37	16s	38
20s	40	24s	42
30s	45	40s	58 55
50s	68	60s	75 @80
70s	85 @90	80s	95 @1.00

Southern Frame Spun Yarn on Cones.

6s	23	8s	23
10s	24	12s	24 @24½
14s	25	16s	25½
18s	25½	20s	26
22s	26½	24s	27½
30s	29	32s	34½
40s	40½	50s	48½

Combed Sea Island Yarns—Skeins or Cones.

20-2	68	24-2	69
30-2	70	36-2	71
40-2	74	50-2	82
60-2	86	70-2	92 @94
80-2	97	90-2	$1.02
100-2	$1.30	120-2	1.45
150-2	1.60 @$1.65		

Combed Egyptian Skeins.

20-2	58	24-2	61
26-2	62	30-2	68
36-2	68	40-2	70
45-2	73	50-2	76
60-2	83	70-2	93
80-2	$1.03	Carded quality 3c less.	

Egyptian Mule-Spun On Cops.

Carded.

8s	43	12s	44
16s	46	20s	47
24s	49	30s	52
40s	55		

Combed.

8s	48	12s	49
16s	51	20s	52
24s	53	30s	55
40s	60		

The Atlas Yarn Company, of Southbridge, Mass., are offering their complete, 16,000 spindle Cotton Yarn Mill equipment for sale in lots to suit customers, as appears elsewhere in this issue. It is understood, the company is compelled to vacate the building occupied by them. The plant is at present in full operation, producing high grade yarn for the weaving, knitting, and tire fabric market.

The Link Belt Co., are enlarging their malleable foundry at Indianapolis in order to meet the increased demand for their products. The foundry extension will be a one story building, 70 x 275 feet, with a wing 106 x 140 feet. This will house their fifth melting furnace and will provide space for some sixty molders.

Sea Island Cotton Report, Season 1915-16.

BY CABELL AND PEEK, SAVANNAH.

During early August, 1915, there was a demand for all available Fancy and Extra Choice at basis of 25c landed for Fancy for immediate shipment. At the same time business was placed for later deliveries at a concession of from ½ to 1c from this basis for these grades. After this mills waited for lower prices, and when the business came out several weeks later, it was placed in considerable volume around 19 to 19½c, landed, for Extra Choice. A large short interest was created among dealers around these prices and the market reacted quickly from these lower levels advancing steadily to a basis of 30c, landed, for Fancy. On this advance accumulated stocks were unloaded where possible but some dealers were left with their holdings and sold out at a loss of from 4 to 5c per lb.

The market then steadied around 26½c, landed, for Fancy and continued there until early December when the greater portion of the crop had moved to the ports. Prices then hardened until they reached 31c landed for Fancy during the middle of January. After this and until the end of the season the market fluctuated but slightly and closed quiet with a comparatively small unsold stock, which is firmly held.

The season was one of unusual fluctuations occasioned by the large orders placed for goods requiring sea island cotton together with the manipulation of the market in order to force prices for accumulated stocks.

The demand for Extra Choice predominated throughout the year. Fancy was shipped for Extra Choice during the early part of the season due to a lack of demand for the former grade, but, as prices hardened, all grades were in demand and considerable cotton was readily taken in round lots. Of the unsold stock at the close of the season Fancy constitutes the larger proportion with very little Extra Choice and Choice available.

The crop was a high grade one averaging about Extra Choice. As a whole the staple was satisfactory except in the case of some cotton raised in outlying territories usually devoted to Upland Cotton.

The Ginners' Report shows a crop of 91,920 bales, while the total into sight for the season was 86,748 bales. At the beginning of the season estimates pointed to a crop of about 100,000 bales, but this amount was not realized due to lack of or very low proportion of potash in the fertilizer used and to unfavorable hot and dry weather in August and September. Caterpillars were also very destructive in some parts of the belt and particularly in Florida.

At the beginning of the past season there was an available supply in the interior and at the ports of about 3,400 bales. The ginnings for the season amounted ot 91,920 bales giving a total to account for of 95,320 bales. The mills have taken out during the season 85,746 bales and at the end of the season there was on hand, in the interior and at the ports, a supply of about 5,500 bales making a total acounted for of 91,246 bales. This gives a discrepancy of about 4,000 bales, which may be accounted for by a difference in the Jacksonville or interior stocks, a small addition to the Savannah receipts and a larger overland movement than has been reported. There is also the possibility that the Ginners' Report for sea island cotton was too high, as upland cotton was raised to a considerable extent in some sections of the sea island belt. This condition brings about the possibility that the gins, in making their reports, included some of the upland cotton in their sea island figures.

CROP OF 1916-17.

On account of the high prices paid for sea island cotton during the season just past, there has been a general increase in the planting throughout the belt, amounting to about 17 per cent.

The crop has been poorly fertilized due to lack of potash and made a late start, due to long spells of dry weather at planting time. A large portion had to be replanted. This dry weather was followed by beneficial rains throughout the belt and the crop was making very satisfactory progress until early July, when the belt was visited by entirely too much rainfall, lasting throughout the month. This caused a great deal of damage. The progress of the crop depends entirely upon the weather conditions from now on, making a possible crop about equal to that of last season, with favorable weather. Adverse conditions from now on, however, will prove very damaging.

Reports indicate that the crop will be from 10 to 15 days later than that of last year.

Prices are not yet established for new crop delivery. We hear of but small business being placed for such deliveries. Ideas of interior dealers vary materially and but few are willing to contract ahead at a basis of the ideas of mills.

GINNING BY STATES FOR THE PAST FIVE SEASONS.

	Georgia	Florida	South Carolina	Total
1915.....	57,572	28,170	6,178	91,920
1914.....	42,395	33,613	5,590	81,598
1913.....	43,305	25,587	8,671	77,563
1912.....	43,736	22,334	7,707	73,777
1911.....	72,904	41,270	5,119	119,293

SEA ISLAND QUOTATIONS, AUGUST 12, 1916.

	Delivered Domestic Mill Points
Fancy Georgias and Floridas.....	31½c
Extra Choice Georgias and Floridas.....	31c
Choice Georgias and Floridas	30c
Extra Fine Georgias and Floridas.....	29c
Fine Georgias and Floridas.....	27c to 28c
Lower Grades Georgias and Floridas.....	24c to 26c

Savannah stock on hand, 2,048 bales.

With practically no Fancy and Extra Choice offering in the Savannah stock and about 1,500 unsold bales, the quotations given are firm.

The Georgia Society of the City of New York desires information regarding the names and addresses of all Georgians at present residing in New York City. If the readers of this paper will forward such information as they have to Powell Crichton, Secretary of Georgia Society, at No. 120 Broadway, New York City, the information will be used for the purpose of making a complete list as well as to add to the membership of the Society.

The history of cotton growing in Brazil is to be had only in the nature of fragmentary data, but these show clearly that the country, with its vast area and favorable climatic conditions, has grown cotton systematically at least since the beginning of the nineteenth century.

Manufacture of Bleaching Materials.

A summary of the general results of the 1914 census of manufactures with respect to the production of bleaching materials has been issued by the Bureau of the Census.

The products of this industry embrace chloride of lime or bleaching powder, chloride of soda, and other hypochlorites; hydrogen peroxide (or dioxide); sodium and other peroxides (or dioxides); bisulphites of soda, lime, etc.; chlorine, sulphur dioxide, lime sulphur solutions, etc. This report is confined to these products as articles of commerce and does not embrace those made and consumed in the same plant. Many of the products are now manufactured by the aid of electricity.

The manufacture of bleaching materials for sale was reported by 51 establishments in 1914 and by 48 in 1909. The total value of products made for sale in 1914 was $4,964,403, an amount which exceeded the corresponding figure for 1909 by $1,748,675, or 54.4 per cent. The statistics with respect to specific groups of bleaching materials are as follows:

Hypochlorites constitute the most important class, the production in 1914, aggregating 222,152,000 pounds, valued at $2,578,269, and exceeding that of 1909 by 90.2 per cent in quantity and 44.3 per cent in value. This class consists principally of chloride of lime (bleaching powder), but also includes relatively small quantities of chloride of soda and other hypochlorites. A large amount of these products is made electrically. The manufacture of hypochlorites was reported by 9 establishments in 1914 and by the same number in 1909.

Hydrogen peroxide, or hydrogen dioxide (H_2O_2), was manufactured by 20 establishments in 1914 and by 17 in 1909. The production in 1914 was reported as 32,594,807 pounds, valued at $1,303,596, and in 1909 as 9,925,568 pounds, valued at $870,541. Because of lack of uniformity in the strength of solutions, the quantities are not comparable, but in value the 1914 product exceeded that of 1909 by 49.7 per cent.

Bisulphites of soda, lime, etc., were reported by 14 establishments in 1914 and by 15 in 1909. The production in 1914 was 26,346,000 pounds, valued at $243,559, representing a decrease of 16.9 per cent in quantity, together with an increase of 7.7 per cent in value, as compared with the output in 1909.

The production of *chlorine* for sale in 1914 was reported as 12,217,000 pounds, valued at $472,836. No figures for 1909 are available. The output of other bleaching materials, including sodium peroxide, sulphur dioxide, lime-sulphur solutions, etc., in 1914 was valued at $366,143.

A broken belt may start to roll up, get caught, and then pull down a section of the line shafting. The only method of preventing these accidents is to provide suitable guards for the belts so that even if they break they will not be thrown off. Frequent inspection to remove dirt and grit, and to find weak places is also of great value. If the belts are seriously worn, the expense of replacing them should not be spared, because the added efficiency and greater freedom from accidents will be ample compensation.

BOOK REVIEWS

All Books Reviewed Under This Heading May Be Procured From COTTON at the Published Price.

DAVISON'S TEXTILE "BLUE BOOK" for the United States and Canada. Twenty-Ninth Annual edition. Price, postpaid, office edition $4.00; pocket edition $3.00; salesman's directory (mills only) $3.00. Published by the Davison Publishing Company, New York.

Davison's textile "Blue Book" directory is a well known and often used desk appliance in the textile trade. It contains a list of all the mills of the United States and Canada suitably thumb indexed to separate the cotton, woolen, silk and jute, knit goods, dyeing and finishing plants. It also has a list of dry goods commission merchants, cotton and woolen merchants and waste dealers; also a classified index to cotton manufacturers according to kinds of goods manufactured and many other interesting and important details.

HOW TO BUILD UP FURNACE EFFICIENCY. By Joseph W. Hays, Combustion Engineer. Tenth edition, revised and enlarged (fiftieth thousand). 154 pages. Bound in heavy paper. Price $1.00. Published by Jos. W. Hays, Rogers Park, Chicago, Ill.

This is a book well worthy the attention of superintendents and engineers.

CLARK'S DIRECTORY OF SOUTHERN TEXTILE MILLS. Edition of July 1st, 1916. 190 pages. Price $1.50. Published by Clark Publishing Company, Charlotte, N. C.

This little pocket size directory of the Southern cotton mills has been enlarged somewhat and made to include knitting mills and finishing plants. A special feature of this directory is the pink pages in the back where about twenty pages are devoted to hints for traveling men, and contain the names of the larger buyers for the Southern textile mills, with their office addresses. This directory also contains maps of the textile territory which it covers.

THE SOUTHERN RAILWAY TEXTILE DIRECTORY. 40 pages. Sent gratis by the Southern Railway Company, Industrial Department, Washington, D. C.

This textile directory for 1916 is the annual publication gotten out by the Southern Railway Company, and contains statistics and other matter, compiled with great care. Situated along the lines of the Southern Railway, Mobile & Ohio Railroad, Ga., Southern & Fla. Railway and Virginia & Southwestern Railway, are 827 textile plants, carrying 9,865,248 spindles and 214,467 looms. At the present time there are eleven new mills under construction. This little directory covers this territory and gives the detailed statistics about these mills. Copies of this directory cannot be secured through COTTON, but may be had directly from the Industrial Department of the Southern Railway at Washington. D. C.

The Pacific Mills, Hampton Mills Dept., Columbia, South Carolina, have placed a contract with William Firth, 200 Devonshire St., Boston, Mass., for a complete equipment of dustless card strippers, for all their southern mills.

COTTON MANUFACTURING.

A Cushioned Ring With Floating Traveler.

A new high-speed spinning ring has been perfected and is being introduced to the trade, that is so radically different from the former types as to make a rather complete description of especial interest. It is described as an air cushioned ring with a circular, floating, self-lubricating traveler.

In this ring the traveler is a thin convex circle of tempered steel with an upright carrying a rounded and open eye. This traveler is the full diameter of the ring, see Fig. 6. It runs in a self-lubricating raceway where there is

FIG. 1. ON THE LEFT, SHOWS THE COMPLETE RING ASSEMBLED, WHILE ON THE RIGHT FIG. 2 IS THE TOP CASE WHICH HOLDS FIG. 3.

considerable spare space and the nearly flat traveler circle rises on the air by reason of its great speed and so rides on a cushion of air. Friction is very slight, and while the traveler weighs seven or eight times as much as the common traveler, it is claimed that it pulls less on the yarn and has a softer "drag." The eye prong being partially a spring and capable of giving with the varying pull of the yarn, the whole traveler very elastic, and it never "dogs."

It is claimed that because the traveler does not "dog,"

FIG. 3, ON THE LEFT, IS THE LUBRICATED LINER IN WHICH THE TRAVELER RUNS, AND FIG. 4, ON THE RIGHT, IS THE INTERMEDIATE SPACER.

and does pull with a uniform tension that yarn made on this ring out of the same material is from 4 to 7 per cent stronger, there being no thin places in the yarn.

Fig. 1 shows the ring assembled and Fig. 2 shows the top case which holds the lubricated liner or raceway, Fig. 3 This liner is a part which is impregnated in the process of manufacture with a special lubricant. The motion of the traveler warms this liner and causes the lubricant to start, the whole remaining at about 100 degreesF. it is said. When the frame is stopped, the lubricant is of such a nature as to sink back into the pores of the liner. This lubricant will last about two years and no free oil is necessary.

The special shape of the traveler and the use of the lubricating liner allows a constant running speed of about 12,000 r. p. m., and the travelers are guaranteed to run at this speed for one year. What finally wears out is the traveler eye, but tests covering a period of some seven years show that the traveler eyes do not cut the yarn until after a year.

As this traveler draws with a steady tension it causes no thin places and as a result makes yarn from the same material stronger. The yarn is soft, even and well wound besides allowing a greater quantity to be placed on a bobbin. This greater quantity of yarn is secured through the

FIG. 5. THE CENTERING SHIFT PLATE.

even running of the traveler, which does not jump up and down on the ring, but carries steady and true, producing a smooth, evenly wound bobbin.

Several numbers of yarn can be spun with a single weight of this traveler, which is made in suitable weights for different numbers and twists of yarn and can be quickly changed.

The centering shift plate shown in Fig. 5, provides a quick way of shifting rings and recentering them, when

FIG. 6. THE TRAVELER, SHOWING DETAILS.

sizes of rings are changed on the frame. With this plate in place it is claimed that a boy can remove and replace 250 rings in 30 minutes.

Important comparative tests of these rings and travelers were made under actual mill conditions with frames of 256 spindles each, by a mill seeking information for its own purposes. A full and complete report of the result of these tests has been compiled by the manufacturers of this ring, the Union Manufacturing Co., 21 Doane Street, Boston, Mass., and incorporated in a booklet which may be secured for the asking.

Much interest has been shown in the device by everyone who has seen it and orders have been received for trial frame equipments from as far off as Japan and India.

The Economy Fuse and Manufacturing Co., of Chicago, opened a Southern office at 1423 Empire Building, Atlanta, on August 10th to aid in handling the rapid business developments of the South. R. P. Tinkham is in charge.

Graddick's Production Table No. 2

(Copyright, 1914, by F. C. Graddick.)

A production table for filling or hosiery yarn spinning, showing the pounds per day per spindle that can be produced on spinning machinery in Numbers and tenths of average Numbers from 4's to 31's at 10 hours per day. Allowance has been made for all necessary stoppage, such as doffing, oiling, banding, cleaning, etc.

Yarn No.	Square Root No.	Twist per Inch	Front Roll Speed	Spindle Speed	Lbs. per day Per spindle	Lbs. per day Per spindle No. & 10th	Lbs. per day Per spindle No. & 20th	Lbs. per day Per spindle No. & 30th	Lbs. per day Per spindle No. & 40th	Lbs. per day Per spindle No. & 50th	Lbs. per day Per spindle No. & 60th	Lbs. per day Per spindle No. & 70th	Lbs. per day Per spindle No. & 80th	Lbs. per day Per spindle No. & 90th
4	2.00	7.00	182	4000	2.41	2.35	2.30	2.25	2.20	2.15	2.09	2.04	1.99	1.94
5	2.23	7.83	180	4400	1.89	1.86	1.83	1.80	1.77	1.74	1.71	1.68	1.65	1.62
6	2.44	8.57	178	4800	1.59	1.56	1.54	1.51	1.49	1.47	1.44	1.42	1.39	1.37
7	2.64	9.26	176	5150	1.35	1.32	1.31	1.29	1.27	1.26	1.24	1.22	1.20	1.18
8	2.82	9.90	175	5450	1.17	1.15	1.14	1.12	1.11	1.10	1.08	1.07	1.05	1.04
9	3.00	10.50	172	5700	1.03	1.019	1.009	.999	.989	.979	.968	.958	.948	.938
10	3.16	11.07	171	5950	.928	.918	.908	.899	.889	.880	.870	.860	.851	.841
11	3.31	11.61	168	6150	.832	.825	.818	.811	.804	.797	.790	.783	.776	.769
12	3.46	12.12	166	6350	.763	.756	.749	.742	.735	.728	.721	.714	.707	.700
13	3.60	12.62	164	6500	.693	.688	.683	.677	.672	.666	.661	.655	.650	.644
14	3.74	13.10	162	6700	.638	.633	.628	.623	.618	.613	.608	.603	.598	.593
15	3.87	13.50	160	6850	.588	.583	.578	.574	.569	.565	.560	.555	.551	.546
16	4.00	14.00	158	6950	.542	.538	.534	.531	.527	.524	.520	.516	.513	.509
17	4.12	14.43	156	7100	.506	.502	.499	.495	.492	.488	.485	.481	.478	.474
18	4.24	15.06	154	7200	.471	.468	.465	.462	.459	.456	.453	.450	.447	.444
19	4.35	15.26	152	7300	.441	.438	.436	.434	.431	.429	.427	.424	.422	.420
20	4.47	15.65	150	7400	.418	.415	.413	.410	.408	.406	.403	.401	.398	.396
21	4.58	16.04	148	7500	.394	.391	.389	.387	.385	.383	.380	.378	.376	.374
22	4.69	16.42	147	7600	.372	.370	.368	.366	.364	.362	.360	.358	.356	.354
23	4.79	16.79	145	7700	.352	.350	.348	.346	.345	.343	.341	.340	.338	.336
24	4.89	17.15	144	7800	.335	.333	.331	.329	.327	.326	.324	.322	.320	.318
25	5.00	17.51	142	7800	.317	.315	.314	.312	.311	.309	.308	.306	.305	.303
26	5.09	17.65	140	7850	.302	.300	.299	.298	.297	.296	.295	.294	.293	.292
27	5.19	17.84	139	7850	.291	.289	.288	.287	.286	.285	.284	.283	.282	.281
28	5.29	17.99	138	7900	.280	.278	.277	.276	.275	.274	.273	.272	.271	.270
29	5.38	18.29	137	7900	.269	.267	.266	.265	.264	.263	.262	.261	.260	.259
30	5.47	18.45	136	7900	.258	.256	.255	.254	.253	.252	.251	.250	.249	.248
31	5.56	18.66	135	7900	.247	.246	.245	.244	.243	.242	.241	2.40	.239	.238

To find production of average Number read to the intersection of the Number nearest to the 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, or 90th.

Some Designs for Cotton Goods.

BY J. W. K.

A neat design for a cotton dress cloth is shown at Fig. 1. This is made from mercerized and ordinary cotton. The particulars for production are: 36 dents per inch, 2 threads in one dent, 2/40's mercerized and 32's American warp, 72 picks of 32's ring spun per inch for the filling.

The warping pattern is:

1 thread pink mercerized .....2/40's
1 thread black ordinary.....32's

—

2 threads per pattern.

Fig. 2 shows the complete design repeating on 48 threads, the drafting of the heddles is also given. The

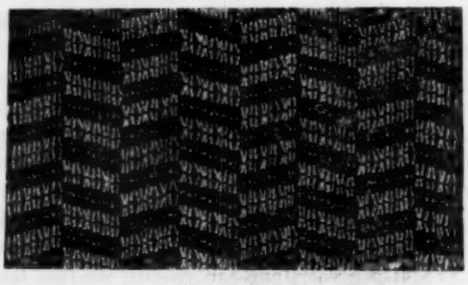

FIG. 1.

harness chain is shown at Fig. 3. The heavy squares on Fig. 2 indicate the method of working the mercerized threads, and the crosses for the black threads which weave

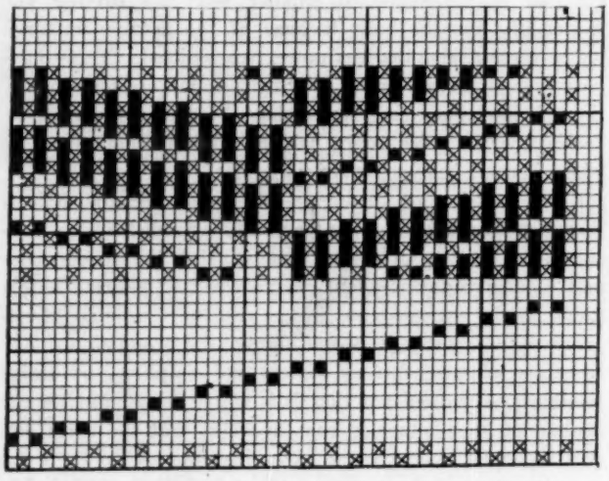

FIG 2

plain. From this it will be seen that one-half of the warp will be mercerized and the other half ordinary.

It is necessary to weave this cloth from two beams, one containing mercerized and the other ordinary yarn, thus, a less length of mercerized will be required than the ordinary on account of the difference of the weave and the nature of the yarn, as the two-fold will stretch considerably more during weaving.

The cloth is generally 30 inches in the reed space for a 28½-inch woven cloth. For 64 yards of cloth allow 70 yards of the ordinary yarn and 67 yards of the mercerized yarn. The particulars are: 72 threads per inch × 30 inches wide = 2160 threads in the warp; 48 threads per design with 2160 threads in the warp would be 44 patterns + 48 selvage threads; 24 threads of mercerized in a pattern × 44 patterns = 1056 threads; 24 threads of ordinary in a pattern × 44 patterns = 1056 threads; selvage = 48 threads; giving a total of 2160 threads.

The weight of each warp may be obtained as follows: 1056 threads × 67 yards of warp ÷ yards per hank 840

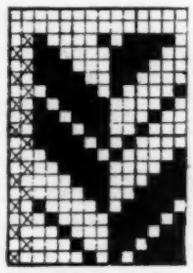

FIG. 3

× 20's counts = 4.21 lbs. of mercerized; 1053 threads × 70 yards of warp ÷ yards per hank 840 × 32's counts = 2.75 lbs. of ordinary.

To secure the weight of filling proceed as follows: 72 picks per inch × 30 inches wide × 64 yards of cloth ÷ 840 yards per hank × 32's counts = 5.14 lbs. Total weight of yarn for 64 yards of cloth, 12.10 lbs., or 5.28 yards per pound.

In Fig. 4 is shown a good class of Oxford shirting. The fine lines are a special feature in this cloth, giving the pat-

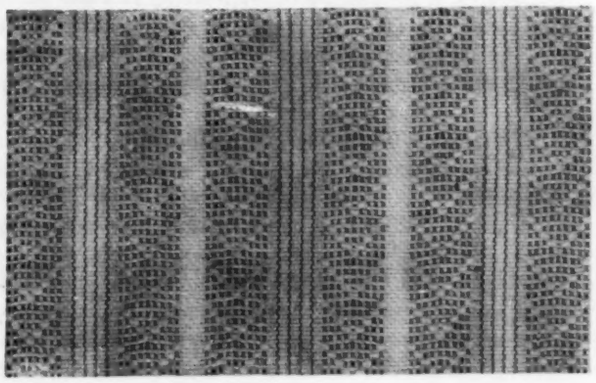

FIG. 4.

terns a neat appearance. The particulars for its production are 44 dents per inch, 2 and 4 threads in each dent, 40's Egyptian or American warp, 40 picks of 10's for the filling.

WARPING PATTERN.

14 threads white = 7 dents.
2 threads navy
2 threads white
30 threads as above = 17 dents.
6 threads white
2 threads red =3 dents.
6 threads white
2 threads red = 3 dents.
6 threads white
2 threads red = 3 dents.
6 threads white
2 threads red = 3 dents.

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A production table for filling or hosiery yarn spinning, showing the pounds per day per spindle that can be produced on spinning machinery in Numbers and tenths of average Numbers from 4's to 31's at 10 hours per day. Allowance has been made for all necessary stoppage, such as doffing, oiling, banding, cleaning, etc.

Yarn No.	Square Root No.	Twist per Inch	Front Roll Speed	Spindle Speed	Lbs. per day Per spindle	Lbs. per day Per spindle No. & 10th	Lbs. per day Per spindle No. & 20th	Lbs. per day Per spindle No. & 30th	Lbs. per day Per spindle No. & 40th	Lbs. per day Per spindle No. & 50th	Lbs. per day Per spindle No. & 60th	Lbs. per day Per spindle No. & 70th	Lbs. per day Per spindle No. & 80th	Lbs. per day Per spindle No. & 90th
4	2.00	7.00	182	4000	2.41	2.35	2.30	2.25	2.20	2.15	2.09	2.04	1.99	1.94
5	2.23	7.83	180	4400	1.89	1.86	1.83	1.80	1.77	1.74	1.71	1.68	1.65	1.62
6	2.44	8.57	178	4800	1.59	1.56	1.54	1.51	1.49	1.47	1.44	1.42	1.39	1.37
7	2.64	9.26	176	5150	1.35	1.32	1.31	1.29	1.27	1.26	1.24	1.22	1.20	1.18
8	2.82	9.90	175	5450	1.17	1.15	1.14	1.12	1.11	1.10	1.08	1.07	1.05	1.04
9	3.00	10.50	172	5700	1.03	1.019	1.009	.999	.989	.979	.968	.958	.948	.938
10	3.16	11.07	171	5950	.928	.918	.908	.899	.889	.880	.870	.860	.851	.841
11	3.31	11.61	168	6150	.832	.825	.818	.811	.804	.797	.790	.783	.776	.769
12	3.46	12.12	166	6350	.763	.756	.749	.742	.735	.728	.721	.714	.707	.700
13	3.60	12.62	164	6500	.693	.688	.683	.677	.672	.666	.661	.655	.650	.644
14	3.74	13.10	162	6700	.638	.633	.628	.623	.618	.613	.608	.603	.598	.593
15	3.87	13.50	160	6850	.588	.583	.578	.574	.569	.565	.560	.555	.551	.546
16	4.00	14.00	158	6950	.542	.538	.534	.531	.527	.524	.520	.516	.513	.509
17	4.12	14.43	156	7100	.506	.502	.499	.495	.492	.488	.485	.481	.478	.474
18	4.24	15.06	154	7200	.471	.468	.465	.462	.459	.456	.453	.450	.447	.444
19	4.35	15.26	152	7300	.441	.438	.436	.434	.431	.429	.427	.424	.422	.420
20	4.47	15.65	150	7400	.418	.415	.413	.410	.408	.406	.403	.401	.398	.396
21	4.58	16.04	148	7500	.394	.391	.389	.387	.385	.383	.380	.378	.376	.374
22	4.69	16.42	147	7600	.372	.370	.368	.366	.364	.362	.360	.358	.356	.354
23	4.79	16.79	145	7700	.352	.350	.348	.346	.345	.343	.341	.340	.338	.336
24	4.89	17.15	144	7800	.335	.333	.331	.329	.327	.326	.324	.322	.320	.318
25	5.00	17.51	142	7800	.317	.315	.314	.312	.311	.309	.308	.306	.305	.303
26	5.09	17.65	140	7850	.302	.300	.299	.298	.297	.296	.295	.294	.293	.292
27	5.19	17.84	139	7850	.291	.289	.288	.287	.286	.285	.284	.283	.282	.281
28	5.29	17.99	138	7900	.280	.278	.277	.276	.275	.274	.273	.272	.271	.270
29	5.38	18.29	137	7900	.269	.267	.266	.265	.264	.263	.262	.261	.260	.259
30	5.47	18.45	136	7900	.258	.256	.255	.254	.253	.252	.251	.250	.249	.248
31	5.56	18.66	135	7900	.247	.246	.245	.244	.243	.242	.241	2.40	.239	.238

To find production of average Number read to the intersection of the Number nearest to the 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, or 90th.

Some Designs for Cotton Goods.

BY J. W. K.

A neat design for a cotton dress cloth is shown at Fig. 1. This is made from mercerized and ordinary cotton. The particulars for production are: 36 dents per inch, 2 threads in one dent, 2/40's mercerized and 32's American warp, 72 picks of 32's ring spun per inch for the filling.

The warping pattern is:

1 thread pink mercerized .....2/40's
1 thread black ordinary.....32's

2 threads per pattern.

Fig. 2 shows the complete design repeating on 48 threads, the drafting of the heddles is also given. The

FIG. 1.

harness chain is shown at Fig. 3. The heavy squares on Fig. 2 indicate the method of working the mercerized threads, and the crosses for the black threads which weave

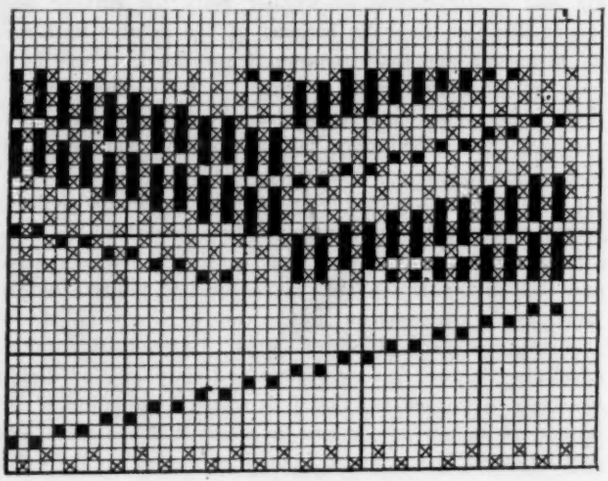

FIG. 2

plain. From this it will be seen that one-half of the warp will be mercerized and the other half ordinary.

It is necessary to weave this cloth from two beams, one containing mercerized and the other ordinary yarn, thus, a less length of mercerized will be required than the ordinary on account of the difference of the weave and the nature of the yarn, as the two-fold will stretch considerably more during weaving.

The cloth is generally 30 inches in the reed space for a 28½-inch woven cloth. For 64 yards of cloth allow 70 yards of the ordinary yarn and 67 yards of the mercerized yarn. The particulars are: 72 threads per inch × 30 inches wide = 2160 threads in the warp; 48 threads per design with 2160 threads in the warp would be 44 patterns + 48 selvage threads; 24 threads of mercerized in a pattern × 44 patterns = 1056 threads; 24 threads of ordinary in a pattern × 44 patterns = 1056 threads; selvage = 48 threads; giving a total of 2160 threads.

The weight of each warp may be obtained as follows: 1056 threads × 67 yards of warp ÷ yards per hank 840

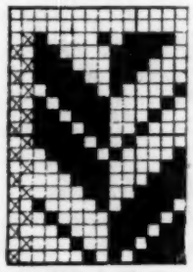

FIG. 3

× 20's counts = 4.21 lbs. of mercerized; 1053 threads × 70 yards of warp ÷ yards per hank 840 × 32's counts = 2.75 lbs. of ordinary.

To secure the weight of filling proceed as follows: 72 picks per inch × 30 inches wide × 64 yards of cloth ÷ 840 yards per hank × 32's counts = 5.14 lbs. Total weight of yarn for 64 yards of cloth, 12.10 lbs., or 5.28 yards per pound.

In Fig. 4 is shown a good class of Oxford shirting. The fine lines are a special feature in this cloth, giving the pat-

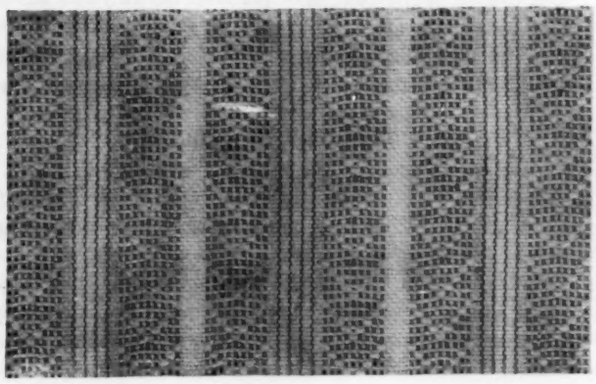

FIG. 4.

terns a neat appearance. The particulars for its production are 44 dents per inch, 2 and 4 threads in each dent, 40's Egyptian or American warp, 40 picks of 10's for the filling.

WARPING PATTERN.

14 threads white = 7 dents.
2 threads navy
2 threads white
30 threads as above = 17 dents.
6 threads white
2 threads red =3 dents.
6 threads white
2 threads red = 3 dents.
6 threads white
2 threads red = 3 dents.
6 threads white
2 threads red = 3 dents.

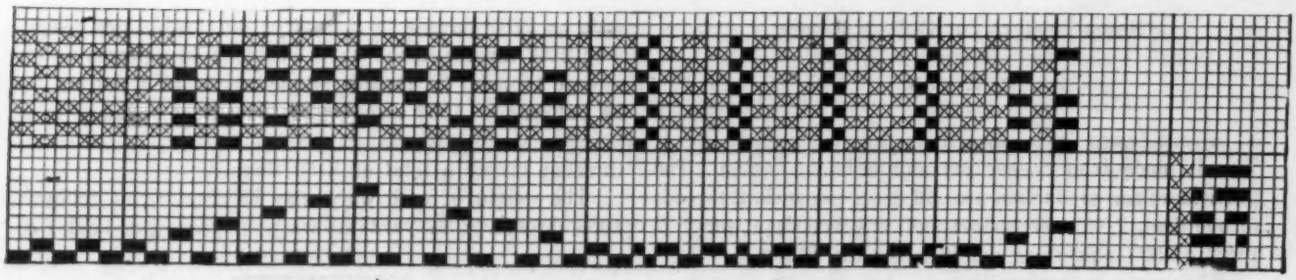

FIG. 5. FIG. 6.

6 threads white
2 threads navy
2 threads white
30 threads as above = 17 dents.
120 threads and 56 dents per pattern.

Fig. 5 shows the complete design repeating on 120 threads, the drafting of the heddles being given also. The harness chain is shown at Fig. 6. The heavy squares on the design indicate the colored threads and the crosses the white threads. This cloth is generally made about 32¼ inches in the reed for a 30½-inch cloth; for 84 yards of cloth allow 88 yards of warp. 32¼ inches reed space × 44 dents per inch = 1420 dents. Dents per pattern, 56, and this divided into 1420 = 25 patterns + 20 dents for selvage. 120 threads per pattern × 25 patterns + 40 selvage threads = 3040 threads in the warp. The weight of the warp = 3040 threads × 88 yards of warp ÷ 840 yards per hank × 40's counts = 8 lbs. of warp. The weight of filling = 40 picks per inch × 84 yards of cloth × 32¼ inches wide ÷ 840 yards per hank × 10's counts = 12.9 lbs. of filling. Total weight of yarn for 84 yards of cloth = 20.9 lbs., or practically 4 yards per pound.

Ball-Bearing Spindles.

Aggregate effect is what makes the spindle bearing important. Not because one ball-bearing spindle saves a little power, or helps make a more uniform yarn is this type better than the journal bearing spindle, but because these seemingly small advantages are multiplied as many times as there are spindles in the ring frames or in the twister frames. Nor would a ball-bearing spindle be preferred if it showed only one superior feature. Here again many advantages make this type stand out from among the various spindles on the market.

The problems connected with ball-bearings applied to spindles have been carefully investigated by C. H. Chapman, the inventor of the well known Eureka spindle. He saw the possibility of enormous savings in power in the driving of spindles in the same way that automobile engineers saw ball-bearings and roller bearings for their vehicles.

A reduction of friction and therefore saving of power, first comes to mind when ball-bearings are mentioned, because the ball-bearing is "frictionless" as compared with the journal-bearing spindle. Every mill man knows that friction increases with the load, so that if the journal-bearing spindle band by a change of tension, increases the load, the friction will increase. Not so with the ball-bearing. Variations in tension have no appreciable effect; therefore, the speed and power are practically constant under all conditions. This constant speed affects the quality and uniformity of the yarn; the yarn has a higher average tensile strength and the tensile strength is more nearly uniform, and it has full twist. The mill man appreciates this uniformity of yarn, for in all subsequent operations the fabric is better, is easier to finish, and there are fewer pieces rejected. Having fewer seconds decreases the general cost of production.

While the power required for spinning frames must vary somewhat in different mills and under varying conditions, it is safe to say that the power required is only one-half or two-thirds as much with the ball-bearing spindle. With a large number of ring frames this saving in power is very noticeable, even though the saving per spindle is small. With a mill operating 3000 hours per year and a horsepower at $30 per year, one can readily see that the saving per frame is considerable.

With 50,000 spindles for instance, the power for journal bearings is estimated at about 700 horsepower, which costs about $21,000 per year. One-third, it is said, can be saved by using ball-bearing spindles. Smaller savings are had in the shape of smaller belts for driving and longer life for the belts because of the greater uniformity in tension and the less power transmitted. There have been several actual cases in which, under ordinary conditions, it is claimed ring frames have been driven very satisfactorily with a belt only half as wide as that necessary when journal bearings were used.

The introduction of highly-developed, perhaps delicate power-saving machinery, is generally attended with a considerable advance in initial cost, causing the conservative and careful superintendent or treasurer to hesitate before going to the expense; but in the case of Chapman Manufacturing Company of Boston, Mass., the production due to carefully planned factory system and simplicity of design has been so worked out that it is stated these spindles can be had at an advance in cost so slight that the extra cost will be saved in five years, including interest on the extra investment; and furthermore, the spindles are designed to fit existing ring and twister frames. Therefore, to obtain greater production from old frames no other change is necessary.

The Federal Trade Commission at Washington has just issued two very interesting booklets which they are sending gratis to manufacturers and merchants throughout the United States. The first of these booklets, which was issued under date of July 1, 1916, contains the fundamentals of a cost system for manufacturers. The second booklet, which was issued fifteen days later, contains a system of accounts for retail merchants. A copy of either of these booklets may be secured without cost on application to the Federal Trade Commission.

Dyeing, Bleaching and Finishing.

The Use of Liquid Chlorine in Bleaching.

BY J. MERRITT MATTHEWS, PH. D.

Practically all of the cotton materials bleached in the United States at the present time are processed by the use of a hypochlorite method of bleaching. This applies to the bleaching of cotton cloth, cotton yarn in the form of skeins or warps, cotton knit goods, and also raw cotton. Up to within recent years, the bleaching agent used almost exclusively for this purpose was chloride of lime, otherwise known as bleaching powder or chemic. During the past few years, however, other methods of bleaching cotton by the use of sodium hypochlorite liquors have been perfected. The principal one of these new processes is that wherein a solution of sodium hypochlorite is used, such liquor being prepared by dissolving chlorine gas in an alkaline solution, such as that obtained from either soda ash or caustic soda. This has been made possible by the manufacture of chlorine gas in a pure state, which by liquification can be placed in suitable containers giving a convenient and ready package for transportation and use. This product is known as liquid chlorine, and has now a very wide use among all the principal bleacheries of the United States.

There are marked advantages in the use of liquid chlorine for the preparation of bleaching solutions which recommend it to the bleacher as a substitute for the older chloride of lime method. In the first place, every bleacher well knows that the preparation of the chemic solution from chloride of lime is one of the most disagreeable features in the bleaching of cotton goods. Chloride of lime comes to the mill, either in drums or large casks, in the form of a powder interspersed with lumps of sometimes considerable size. These containers have to be opened and the solid chloride of lime dumped into a tank with water and the mass is stirred for several hours and then allowed to settle for a considerable period. This gives a supernatent clear liquor containing the hypochlorite of lime in solution, and a very voluminous precipitate or sediment of lime. Only the clear liquor is available for bleaching, and after this is drawn off, the sludge or sediment is run to waste. In making up this chemic solution, there is always a considerable dusting of the dry chloride of lime into the air, and this is frequently carried to the various parts of the mill, and wherever it settles causes corrosion of all metal materials, so that it always brings about considerable damage to machinery, shafting, pulleys, etc. It also is very disagreeable to the workmen employed in the preparation of this chemic solution, as they inhale more or less of this fine dust of chloride of lime, and the mucous membranes are attacked, producing soreness of the eyes, nose, and mouth. Furthermore, very frequently small undissolved particles of the bleaching powder are drawn off from the solution tank with the clear liquor, and become attached to the fabric being bleached, causing stains and burnt places in the material. In fact, this has been a frequent fault in bleaching and has to be carefully guarded against.

Liquid chlorine comes into commerce in steel cylinders or "bottles," the chlorine being held in the liquid form in the cylinder by pressure. The cylinder is provided with a valve, which on being opened, allows the chlorine to escape in the form of a gas. If this gas is conducted into a proper solution of soda ash or caustic soda, it dissolves completely with the formation of sodium hypochlorite. This solution is clear, and contains no sediment or sludge. There is no disagreeable feature connected with the preparation of this solution as the gas is led from the cylinder into the liquor by means of a pipe, the connections of which are gas tight. This method, therefore, permits of the preparation of the chemic solution in a manner which entails no disagreeable feature either to the workmen or to the mill at large.

Chloride of lime or bleaching powder contains 35 per cent to 36 per cent of what is termed available chlorine for bleaching purposes, and in the preparation of the chloride of lime solution there is always more or less loss of active material in the sludge, so that the full 36 per cent of chlorine is seldom utilized to its full amount. About the best efficiency that can be obtained on chloride of lime liquors is 33 per cent or ⅓ of the weight of chloride of lime figured as available chlorine. By the use of liquid chlorine, the entire quantity of the chlorine agent is available for bleaching purposes; that is to say, 100 pounds of liquid chlorine made up into sodium hypochlorite with the proper amount of alkali will give a chemic containing 100 pounds of so-called "available chlorine." In this connection, however, there is a further rather remarkable fact to be considered. The bleaching efficiency, in terms of content of available chlorine of a solution of hypochlorite prepared with liquid chlorine, is much greater than a corresponding solution containing the same amount of available chlorine prepared from chloride of lime; that is to say, 1 pound of liquid chlorine made into sodium hypochlorite solution has a much greater bleaching efficiency than 3 pounds of chloride of lime. Whereas this statement might be viewed rather skeptically by the laboratory chemist, it is nevertheless a fully demonstrated fact resulting from actual mill experience on a large scale. It has been found, in fact, that 1 pound of liquod chlorine has a bleaching equivalent to from 6 to 8 pounds of bleaching powder, and this has been the result of its use on a large scale in a number of well-known bleacheries.

In bleaching with chloride of lime liquors in the bleaching process, there is produced, through the decomposition of the chemic solution which is the lime salt, an insoluble lime compound, since either sulphuric acid or sodium bisulphite are generally employed as sours in the after treatment of the bleached fabric. In both of these cases sulphate of lime is formed, which is quite insoluble in water, and there is always a tendency for some of this sulphate of lime to be left in the bleached fabric, even after considerable washing. When, however, a solution of sodium hypochlorite is employed in the bleaching, and the bleached material is subsequently soured with either of these agents, the

products resulting therefrom are highly soluble in water and do not tend to remain in the bleached fabric. This is very clearly shown by comparative analysis of the same fabric bleached under the same conditions with solutions of chloride of lime and sodium hypochlorite prepared from liquid chlorine. Even under the best conditions of souring and washing, the mineral content or ash of the bleached fabric will be three or four times greater in the case of chloride of lime than in the liquid chlorine method. With chloride of lime, the ash or mineral content of the bleached fabric will run anywhere from 0.12 per cent to 0.25 per cent, whereas by the liquid chlorine method on the same class of fabric the ash would only be 0.03 per cent, to 0.08 per cent. A high content of mineral residue in the bleached fabrics is nearly always the cause of subsequent defects arising in the cloth. It also causes the bleached material to be harsher to the feel, and there is liability of the color acquiring a yellowish tinge when the bleached material is stored. The presence of the mineral matter, especially the lime salts, appears to act as a catalyzer, causing a gradual breaking down of the cellulose molecule and the formation of oxycellulose, and if this goes forward sufficiently the fabric would become tendered or weakened. This condition is more liable to occur in the case where bleaching powder is employed than where the liquid chlorine method is used, as there is much danger in the former case of insoluble lime compound of an active catalytic nature being left in the bleached material.

The preparation of the chemic solution by means of liquid chlorine is so clean and efficient as compared with the use of bleaching powder, that almost any mill which has adopted the former process would be very loath to return to the old method even at a somewhat higher cost of chemicals, and to say nothing of the increased nicety of the bleaching process itself and the diminished danger of defects in the bleached fabric. Any bleacher familiar with the use of hypochlorite solution prepared from chloride of lime can also employ practically his same methods of bleaching, using the liquid chlorine method, the only difference in the process being the manner of making up the chemic solution.

In substituting chloride of lime with liquid chlorine a solution of the latter in the form of hypochlorite should be used, so that the strength of active chlorine from the liquor is about one-half that of a corresponding bleaching solution prepared from bleaching powder. That is to say, if the bleacher has been using a chemic solution prepared from bleaching powder showing 2 grams per litre of available chlorine, the same bleaching efficiency can be obtained with liquid chlorine bleaching liquors containing about 1 gram per litre of available chlorine. In order to get the best results in bleaching and to standardize the methods of procedure, it is always best to test the bleaching liquors as they are being used, for the available chlorine present, as this forms the basis of the bleaching operation. This test can usually be conducted by the bleacher, but he need not be an analytical chemist, using a standardized solution to start with, the chlorine strength of the bleaching solutions with reference to their twaddle can be definitely determined and a uniform bleaching solution can thus be obtained. In the case of a standardized solution of chemic the twaddle or density will not necessarily indicate the chlorine bleaching strength, as the accumulation of inactive salts in the solution tends to raise the density of the liquor without increasing its chlorine strength. Consequently it is always advisable to have a simple chemical control of the strength of the bleaching liquors.

In general it may be said that liquid chlorine solutions may be used under most any conditions to supplant the corresponding solutions of chloride of lime, without changing in any marked manner the usual routine of methods of bleaching. The use of liquid chlorine is a distinct advance in the art of bleaching cotton fabrics, as it furnishes nicer, cleaner, more efficient and more scientific methods, and allows a much more accurate control over the process of bleaching than is the case where solutions of chloride of lime are employed under ordinary circumstances.

Aniline Oil.

At this time, while the local manufacture of aniline oil is attracting the attention of so many hosiery manufacturers, the following extracts on the subject from Thorpe's Dictionary of Applied Chemistry will doubtless prove of interest.

Aniline was first observed by Unverdorben in 1826 among the products of the destructive distillation of indigo. It was detected by Runge in coal tar in 1834, and by Fritzsche in 1840, among the products obtained by distilling indigo with alkali hydroxides. Prepared by Zinin in 1840 by the reduction of Mitscherlich's nitrobenzene with hydrogen sulphide. Unverdorben called his product *krystallin;* Runge, *kyanol;* Fritzsche, *aniline;* Zinin, *benzidam.*

In 1843 Hofmann showed that nitrobenzene could be reduced by a metal such as zinc in the presence of a dilute acid, and also that krystallin, kyanol, anilin, and benzidam were identical with each other. Shortly afterwards Bechamp stated that nitrobenzene could be reduced by ferrous acetate in the presence of water, but that the oxalate, sulphate, etc., had no effect.

In the year 1856 Perkin's discovery of mauve gave rise to a commercial demand for aniline, and the manufacture was commenced by Messrs. Simpson & Maule.

Benzene, then only obtained in small quantities and with much difficulty, as the treatment of tar scarcely existed, was introduced into glass balloons (known as 'bolt heads') of 1 gallon capacity, and the calculated quantity of nitric acid, mixed with about an equal volume of sulphuric acid, was gradually added, the mixture swung around and well agitated, and then allowed to stand. It was usual to have about twenty balloons in a row, and to add acid in turn until the reaction was complete.

The nitrobenzene was separated, washed, and reduced with iron borings and acetic acid, at first in a copper still, later in an iron cylinder. The aniline was freed from water, rectified, and was then ready for use. The selling price was about $5.00 a pound.

Somewhat later cast-iron cylinders of considerable size were used for the reduction, acetic acid being still used and neutralized with soda or lime at the end of the reaction, and the aniline was in some factories distilled off over a naked fire, in others steam was blown into the mixture, and the aniline and water condensed and separated. Acetic acid continued to be used until about 1866. Since that time the apparatus has undergone little change, the treatment consisting in reduction mainly by the use of iron and water, hydrochloric acid being employed to start the reaction.

The aniline machine shown by Thorpe is of the vertical type. A careful comparison between this design and the horizontal machine is said to prove unmistakably that the vertical machine is more economical and better in every respect. This is particularly the case with regard to repairs and maintenance. The machine shown is of cast-iron, 1⅜ inches thick, with a driving gear, agitating shaft, and blades. An important feature is the renewable cast iron-lining plates at the sides and bottom, which protect the machine from the friction caused by the revolving mass of iron borings. It is 6 feet 6 inches deep, and 4 feet 6 inches in diameter, having a total capacity of 650 gallons. Steam is admitted through the vertical shaft, which is hollow, and passes through the extremitites of the horizontal agitating blades. Twenty-one of these machines are required to produce 150 tons of aniline oil per month. Much larger machines on the same principle are being used by some manufacturers. A charge of 1000 pounds of nitrobenzine is run into the receiving pan above the machine. To start the reaction, 1 cwt. of clean cast-iron borings, 10 gallons of hydrochloric acid, and 6 gallons of water are run in through the funnel shaped hopper, and simultaneously steam is turned on and the nitrobenzine run in a thin stream into the dish on the top of the machine. A wooden plug in the hopper is driven in tight, and the space between it and the hopper is kept full of iron borings. By dextrously manipulating the wooden plug, the borings can be added without allowing any vapor to escape. This simple method of 'feeding' the iron borings is said to have proved better than many of the mechanical feeding devices that have been tried.

Distillation proceeds, and the distilate passes through a condenser and runs back into a receiving tank, together with the nitrobenzine which is carried over. The iron borings and nitrobenzine are added only in sufficient quantities to maintain a constant level in the tank. If the reaction proceeds too violently, loss is caused by the formation of benzene. When the level of the liquid in the tank begins to lower, the supply of nitrobenzene and iron borings is increased This process is continued until the whole charge of nitrobenzene is run in, which takes about 10 hours. The total weight of iron borings required is 9 hundredweight. A sample caught as it runs from the condenser should then be quite free from nitrobenzene, and the machine will contain only aniline oil, water, and oxide of iron. The supply of steam is then increased, so as to distill over the aniline oil and water, and the distillate is diverted into a tank beneath the condenser. In some plants this distallation is not done, but the contents of the reduction apparatus are passed immediately through a filter press, the filtrate then running directly to, or being pumped into settling tanks.

The steam used for this distillation is not pure steam, but is generated from the aniline water, mentioned later on, in a separate boiler. The aniline water is that which separates from the oil in the separating tubes, and contains about 2 per cent of aniline oil in solution. The aniline and water in the tank below the condenser are pumped into settling tubes, and allowed to settle for 48 hours. The distillation of the oil and water from the machine takes about 7 hours, and during the last hour pure steam is again used, so when the operation is finished, the condensed water left in the machine will be free from aniline, and can be used for flushing out the oxide of iron into a gutter which runs to the settling tanks outside.

The oxide, after the water is drained off, is dried and ground, and disposed of for the purification of coal gas from sulphur. Large quantities are also now being used in the manufacture of cheap black paints, and the consumption in this direction is increasing. The aniline oil which has settled to the bottom of the settling tubes is run off into an air-pressure egg below, and blown into crude aniline oil storage tanks, ready for the final purification by distillation in the vacuum still. The upper layer of water left in the settling tubes, and which contains about 3 per cent of aniline in solution, is, as already explained, used for feeding the aniline steam boiler. The average yield of crude aniline oil from each machine, with a charge of 1,000 pounds of nitrobenzene, is 765 pounds. The yield of pure aniline oil from nitrobenzene is given further on.

The final purification of the crude aniline oil is done in a vacuum still. The body of a still for this work is wrought-iron, about 15 feet long, and 7 feet 6 inches in diameter, having a total capacity of 4,000 gallons, and capable of distilling 35,000 pounds in one charge. The steam is supplied from a boiler having a working pressure of 100 pounds per square inch, at which pressure the steam possesses a temperature of 338 degrees. The internal steam tubes are wrought-iron, 2 inches in diameter. In place of the usual straight tubes which used to be expanded into both end plates, bent tubes are frequently employed, which enter and return to the same end of the still. This prevents the "tearing" of the tubes owing to expansion and contraction, and "breathing" of the end plates. The "column" is of cast iron, 18 feet high and 9 inches in diameter. Condensing coils consisting of three vertical flat copper coils, 2 inches in diameter, arranged side by side in a wrought-iron tank, they are arranged so the distillate may enter all the coils simultaneously from the still head by means of branch pipes. The total length of copper pipe in the condenser is 432 feet. Two receivers permit continuous working, so that when the first is full, as indicated by the gauge-glass tube, it is shut off, and the second brought into use.. The contents of the first can then be drawn off while the second is being filled, and the vacuum is thus maintained throughout.

In operation the still is charged with 35,000 pounds of crude aniline oil from the storage tank, and steam is turned on. The first fraction, about 7 per cent of the distillate, consists of aniline oil and water, which is added to the crude oil and water in the separating tubes. The next fraction is "light aniline," and consists of aniline oil with a small quantity of benzene. If the reduction of the nitrobenzene has been carefully performed, this fraction is only about 4 per cent of the distillate. It is collected and redistilled, giving pure aniline and benzene, the latter being returned to the nitrobenzene department, to be renitrified. The next fraction is pure aniline oil of marketable quality, clear and water-white. The tail end, called "last runnings," forms about 5 per cent of the distillate, and, on redistillation, yields 80 per cent of pure marketable aniline oil. The total yield of pure aniline oil obtained from nitrobenzene is 71¾ per cent. As the pure benzene yields 15½ per cent of nitrobenzene, and the latter 71¾ per cent of pure aniline oil, the total yield

of pure aniline oil from pure benzene is 110.85 per cent. Compared with theory, there is little room for improvement.

The process of reduction and rectification as described applies also to toluidine, and modifications of the process are also in use for the production of xlidine and alpha-naphthylamine, and of the reduction portion for the manufacture of metaphenlene—and metatolylene-diamine from the respective dinitro-compounds.

Aniline oil, as it occurs in commerce, may contain as impurities water, traces of insoluble hydrocarbons and of orthotoluidine, sometimes traces of hydrogen sulphide, and, if carelessly made, of nitrobenzene, benzene, and ammonia. Besides these, which should be carefully tested for, there is possibly a certain amount of aminothiophen, which has no deleterious action for most, if not all, of the purposes for which aniline is used, and which, moreover, for the present at least, cannot readily be got rid of.

The method of testing usually adopted is to determine the boiling-point of the sample. For this purpose 100 c. c. are introduced into a small boiling flask with side tube, and distilled through a short condenser into a graduated 100 c. c. cylinder. Readings of the thermometer are taken as each 10 c. c. of the cylinder fills, and the last when 95 c. c. are filed. An alternative method is to take readings of the cylinder at each fifth of a degree rise of the thermometer. It is also usual to note the temperature when the first drop has fallen from the condenser. The thermometer readings should be corrected for barometer and immersion of mercurial column in the vapor of the liquid, and of course for the errors peculiar to the thermometer in use.

A few fragments of platinum wire, fire-brick, or wrought iron, should be placed on the bottom of the flask, and great care used to adjust the size of the flame and rate of boiling. The flask also should be held by the neck in a good clip over the naked flame, gauze being apt to cause currents of heated gas to flow up round the neck of the flask and superheat the vapor.

The specific gravity of the sample may also be taken (pure aniline has a specific gravity of 1.0265 to 1.0267 at 15 degrees), although this indication is not of great moment if the boiling-points are good.

An example of the determination of the boiling point is the following table:

Temperature	Percent Over	Temperature	Percent Over
182 4°	3	183 2°	20
182 6°	4	183 4°	97
182 8°	5 5	183 6°	98
183 0°	11	183 8°	99

Pure aniline may be tested for insoluble oils by dissolving 10 c. c. in 40 c. c. of hydrochloric acid and 50 c. c. of water. The solution should be quite clear.

If in carrying out the boiling test, the temperature rises considerably at the end, the presence of toluidine may be suspected. This can be detected when a considerable quantity of commercial pure aniline is made into acetanilide. On recrystallizing this and working up the mother liquors, a small quantity of impure acetyl compound of low melting-point will always be found in the most soluble portion, or first mother liquors.

Nitrobenzene shows itself with the insoluble hydrocarbons. A very delicate test for it is to shake the sample of aniline violently for a few minutes, and then to notice the color of the froth. The merest trace of nitrobenzene colors it a very distinct yellow.

The presence of water may be detected by distilling the sample (100 c. c.) as for a boiling-point determination, and collecting the first 10 c. c. in a narrow graduated cylinder of 15 c. c. capacity, shaking with 1 c. c. of saturated sodium chloride solution; and reading off the volume of the latter. The method will not show the presence of less than 0.3 per cent of water, consequently 0.3 c. c. must always be added to the amount of salt solution observed. It is not usual for aniline, sold as pure, to contain more than 0.5 per cent of water.

* * * * * * *

Referring now to American practice, the following additional information has been furnished by Nathan Owitz of the J. P. Devine Company, Buffalo, N. Y., who are large manufacturers of chemical machinery and apparatus.

American equipment for the production of aniline oil has been developed largely during the past two years through the efforts of the J. P. Devine Co., and while the same principles are employed in the production, more highly efficient machinery has been designed. The equipment is stronger, of more liberal design, and with details of refinement brought about by the experience of a number of plants which have been forced to very high productions with moderate sized apparatus. This has naturally developed the weak points in the earlier equipment which have been rectified by the latest designs.

The raw materials employed in the production of aniline consists of chemically pure benzol, commercial sulphuric acid, 66 degrees Be. and commercial nitric acid, 40 degrees Be.

As in the old method, the nitration of the benzol is the first step in the process, nitrobenzol being the product of this operation. The nitration is conducted best in large cast iron nitrators which may have a capacity of as much as 1500 or 1600 gallons. The nitrator, shown at Fig. 1, has a stirring device which consists of a propeller operated by a vertical shaft running down through the center of the cover. As it is essential that excellent agitation be provided, this propeller is run at a relatively high speed, at least 120 revolutions per minute and better at 130 or 140 revolutions. The nitrator has a jacket through which cooling water may be circulated and has also an internal cooling mantle, located inside the nitrator, which consists of a water-cooled cylinder. This cylinder provides additional cooling where the heat of the reaction is greatest.

It is absolutely necessary that careful attention be given to this cooling arrangement in nitrating kettles. Where an exact amount of cooling surface is necessary, the kettle is provided with a corrugated internal cooling cylinder which provides a greater cooling area than the plain cylinder. This, however, is not necessary for the reason that the standard internal cooling cylinder presents sufficient cooling area for all purposes. Besides using this internal cooling cylinder as a cooling medium it serves another important function. The stirring device attached to the end of the reversible shaft is within this internal cooling cylinder, with sufficient clearance allowed so that the material can be drawn into the stirring device, as an impellor of a centrifugal pump draws water, and discharges the liquid material downward out to the sides of the kettle and down again into the stirring device inside of the cooling

cylinder. This allows for a constant and keenly agitated solution which is most important.

The charge of benzol is first placed in the nitrator and cooled by admitting water to the water jacket and also to the internal cooling mantle. The mixed acid consisting of sulphuric acid and nitric acid is run into the benzol sufficiently slowly so that excessive heating does not take place.

FIG. 1. A NITRATING KETTLE.

After all the acid is admitted, the stirring device is stopped, and the spent acid which has not been used in the course of the nitration, is therefore permitted to settle to the bottom. This acid is drawn off and is re-concentrated for use over again.

It so happens that this is a peculiarly fortunate chemical reaction. The entire amount of benzol is converted to nitrobenzol and there is practically no nitric acid left after the nitration. The nitrobenzol is next drawn off and washed with water containing a little soda. These washers ordinarily have a capacity of about 1000 gallons and the mixture of nitrobenzol and water is made thorough and complete by agitating with a jet of air blown in at the bottom and rising up in numerous bubbles through the liquid. After the air agitation is stopped the nitrobenzol separates out from the water on standing for a few hours.

The next operation is the reduction of the nitrobenzol to aniline oil. This takes place in cast iron reducers which cannot advantageously be made quite so large as the nitrator, and had best be about 1000 gallons capacity.

The reducer, which is shown in Fig. 2, is provided with an iron rake which revolves near the bottom of the kettle. This rake must be of excellent material and construction to stand the wear to which it is subjected. The charge of nitrobenzol is run into the reducer and a small amount of hydrochloric acid is added. Now iron turnings are thrown into the mixture, which react in such a manner as to make aniline oil directly. The iron is added so that the mixture is kept boiling, but so that it does not boil too vigorously and foam over. The turnings are charged through a hole in the cover through a small hopper in which is placed a wooden plug as previously described. By dextrously manipulating the wooden plug, the turnings can be added with only a small loss of vapor. After all the turnings are added, a little common salt is stirred into the mixture and then the rake is lifted from the thick sludge which has formed in the bottom. A device for lifting the rake, as

FIG. 2. ONE OF THE REDUCTION KETTLES.

developed by the J. P. Devine Co. has proved of great assistance in the operation, as it eliminates the possibility of getting the machine clogged up. After settling, a considerable portion of the aniline oil may be drawn off, as it

separates out quite readily. The remainder of the aniline oil which is in the reducer is distilled off with live steam. This is accomplished by admitting steam to the bottom of the reducer through holes in the rake or through a cast iron pipe. The distillate is condensed and is a mixture of aniline oil and water. This separates on standing and the aniline oil is drawn off. The water from which this aniline oil has separated contains a small amount of aniline. This is run to special boilers which are used to supply steam for the distillation, and in this manner, the loss is reduced to a minimum. A surprisingly high yield of aniline is thus obtained.

The total yield of aniline from the nitrobenzol is very high and as the yield of nitrobenzol from benzol is prac-

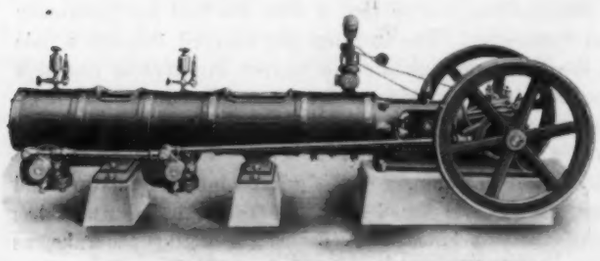

FIG. 3. A STEAM DRIVEN, TWO CYLINDER, ROTARY VALVE, HIGH EFFICIENCY VACUUM PUMP ESPECIALLY ADAPTABLE FOR ANILINE OIL PLANT WORK.

tically the theoretical yield, the over all yield frequently runs as high as 98 per cent. That is, one and one-sixth pounds of aniline are commercially obtained from each pound of benzol in many plants.

The iron sludge from the reducers has been made use of in Europe as a by-product, but has not yet been found to be of sufficient value to warrant recovery in the United States. It has been dried, ground and disposed of for the purification of coal gas from sulphur. A large portion of it has been used for the manufacture of cheap paint, and the consumption in this direction is increasing.

Aniline oil equipment has been standardized and apparatus may be secured for all sizes of plants from 250 to 10,000 pounds per day. A complete plant for the manufacture of 1000 pounds of aniline oil would consist of the following apparatus:

1—Sulphuric acid storage tank.
1—Nitric acid storage tank.
1—Benzol storage tank.
1—Mixed acid mixing tank.
1—Mixed acid storage tank.
1—Benzol mixing tank.
2—Improved type nitrating kettles equipped with water jacket, internal cooling cylinder, bottom discharge and all necessary openings in the cover.
1—Nitrobenzol washer made of cast iron with a flanged conical bottom equipped with bottom discharge, air inlet pipe and all the necessary openings.
2—Reduction kettles as described, each equipped with its condenser.
2—Separators made of sheet steel equipped with bottom discharge.
1—Aniline still with its necessary condenser, column and sheet steel vacuum receiver.
1—High efficiency dry vacuum pump.

A plant for turning out 1000 pounds of aniline oil per day would require a building 75 feet long, about 30 feet wide and about 25 feet high and would require approximately 10 horsepower to drive the necessary pieces of moving machinery, and about 500 pounds of steam per hour or 15 boiler horsepower.

Sumac.

BY WILLIAM B. NANSON.

Sumac or sumach is the common name for plants of the genus *rhus* (the Latin name) of the cashew family or *anacardiaceae*, which includes, besides the cashew, the mango and other tropical fruits. The sumacs are represented in the United States by about 12 species, which are shrubs or small trees with alternate, sometimes simple, but generally trifoliate or odd pinnate leaves, and small polygamous flowers in tuminal or axillary pannicles; the sepals and petals are five, and the stamens, also five, are inserted under the margin of a disk which lines the calynx. Our species are separable into several well marked genera or subgenera. 1. The sumacs proper, with primate leaves, flowers in a terminal crowded panicle, and the globular fruit clothed with acid hairs, the plants not poisonous, and containing an abundance of tannin. The smooth sumac (*rhus glabra*) is the most common, often covering extensive tracts of barren soil. It grows from 2 to 12 feet high with leaves a foot or more long; the fruit, in dense clusters, is of the richest crimson, with a velvety appearance, from the number of small hairs; it has a pleasant acid taste, due to the presence of a great abundance of bimulate of lime. The leaves of this species are among the first to put on autumn colors, and show fine tints of yellow and scarlet.

The stag's horn sumac (*rhus typhina*) is the largest of the northern species, sometimes reaching 30 feet, but is usually about 10 feet; it is readily distinguished from the preceding by the copious soft velvety down which clothes the ends of the branches, the wood and abundant pith are yellowish or orange colored; the clusters of fruit, at first crimson, turn purple in autumn; they have the same acid properties as the foregoing.

Besides these there are other varieties, all natives of the United States, all suitable for dyestuffs and all containing from 15 to 20 per cent of tannin.

All those described are nonpoisonous shrubs; but the poison ivy or poison oak, the dogwood and the coral sumac are all sumacs of the same genera but poisonous and are not used for dyeing.

The sumac of commerce consists almost entirely of the imported leaves of *rhus coriaria* of southern Europe and northern Africa; it greatly resembles in appearance our stag's horn sumac, and like that forms a small tree; it is largely cultivated in Sicily, where the suckers are planted in rows about 4 feet apart, and the shoots are yearly cut back to within a few inches of the ground, the crop for the next year being furnished by the new stems which push from the stumps; the shoots are dried and threshed, and the leaves are finally ground between millstones and bolted, and the powder is put into sacks of 163 pounds each for shipment;

the product is sometimes adulterated with other leaves, but when pure contains from 30 to 35 per cent of tannin.

The preparation of our native sumacs have assumed considerable importance since the European war and might be made to have far reaching significance. The plants grow so abundantly in the wild state that cultivation has not been attempted but it is the opinion of the writer that proper culivation could be made to pay upon soils too barren or unsuitable for other crops. It is also my opinion that the sumacs, more than most plants, derive much of their sustenance from the nitrogen in the air. The stag's horn and the mountain sumac are collected indiscriminately, but as the first named is the most abundant our native product consists mainly of that; the gathering begins early in July and continues until frost comes. The leafy tops of the plants are broken off, and carefully dried, preferably in the shade; when dry, they are beaten with sticks, and the leaves are taken to the mill to receive the same treatment as that described for Sicilian sumac.

I would say here that Chinese galls are the result of the puncture and deposition of the egg of an insect in the leaf stalks and young shoots of a sumac (*rhus semiolata*) of northern India, China and Japan, and they contain about 70 per cent of a tannin which is practically identical with the sumacs of commerce.

Sumac is the only tanning or astringent matter besides Chinese galls in which the tannin is identical with that of gall nuts. In sumac, however, there is a comparatively large quantity of gallic acid present, as also a yellow coloring principle.

A decoction of sumac, which has a greenish, yellow hue, and a peculiar odor, has a distinctly acid reaction, becomes turbid on cooling, and gives the following reactions:

Gelatin. Abundant white precipitate.

Alkalis. White precipitate, which takes a green or reddish shade if an excess of alkili is added.

Lime, baryta and strowtia waters. White precipitate, passing to green on exposure to air.

Acids. Render it more or less turbid.

Alum. Abundant pale yellow precipitate.

Acetate of lead. Flocculent canary colored precipitate.

Acetate of copper. Flocculent yellowish brown precipitate.

Persulphate of Iron. Colors the liquor blue with a slight greenish tint, and gives an abundant blue precipitate.

Protochloride of tin. Abundant yellowish white precipitate.

Tincture of Iodine. Produces a remarkable effect, developing a pink color, which is soon destroyed.

In consequence of the powdered state in which sumac is sold, the tannin matter which it contains is easily affected by contact with the air, and especially by damp, the gallo-tannic acid which it contains being gradually decomposed into gallic acid and glucose. Gallo-tannic acid combines with gelatin, albumen, or animal matters existing in skins, producing an insoluable compound which fills the pores of the animal tissue, and thus contributes, not only to prevent its putrification, but also to render it impermeable to water; gallic acid, however, does not combine with the animal matters, and can therefore take no part in the tanning or curing of a hide. It will thus be readily seen that exposure to the air or damp, rapidly deteriorates sumac for the purposes of the currier, but even if kept dry the same change goes on slowly, in consequence of the presence of a ferment, so that the longer a sample is kept the less value it has.

Gallic acid reduces the ferric salts (peroxide of iron) to the ferrous state (protoxide), the color at the same time disappearing so that it is not available for the dyer, who uses sumac in conjunction with the persalts of iron. For these purposes the tannic or rather gallo-tannic acid is the only valuable constituent of sumac, and it is of great importance to be able to ascertain with accuracy the amount of that substance present in any given sample.

Sumac, or more correctly the tannic acid it contains, is used as a mordant on cotton and flax fibres to fix colors which could not be otherwise employed; and this property of tannic acid is often enhanced by passing the goods, after they have been treated with sumac, through a bath of protochloride of tin. It is largely used for this purpose in Europe, either alone or in conjunction with salts of tin, to mordant the cotton warps of the mixed fabrics so extensively manufactured there. By this means the cotton takes on the same colors as the woollen weft, both with the vegetable dyestuffs, and also with the aniline colors.

A decoction of sumac must be used immediately it is made, as it contains a ferment called pectose, which at ordinary temperatures quickly decomposes the gallo-tannic acid, whilst at 150 degrees the fermentation takes place much more rapidly. For the same reason the extract rapidly deteriorates, becoming ropy, whilst at the same time an abundant brownish-yellow precipitate is produced.

The writer found some years ago that the addition of one per cent of carbolic acid to a decoction of sumac prevented this decomposition taking place for a long time, and, as phenol is a neutral substance, it does not interfere in the slightest degree with the decoction, nor does it exert any injurious action on the coloring matters with which it comes in contact. In most chemical tables showing the action of metallic salts upon a solution of sumac, it says that the protosulphate of iron (copperas) gives a purple tint and no precipitate, whilst the persulphate of iron gives a deep blue black precipitate. It must not be inferred from this, however, that the persulphate of iron is better adapted for dyeing blacks than the protosulphate for this result is true only at the time the mixture is made; but in the course of twenty minutes the blue black from the persulphate becomes a brownish slate, whereas the purple tint of the protosulphate changes during the same time to a deeper black; and this change continues until the former has almost faded out entirely, and the latter has become a perfect ink or jet black.

A little sulphuric acid added to a solution of sumac retards fermentation, but is not advisable where dark shades are to be dyed, for light slates and drabs and modes, however, it is a good thing, it makes the colors clearer and softer, but either the addition of acid or exposure to the air soon destroys the coloring matter which sumac contains and it is advisable, therefore, in all cases, to use the sumac newly boiled.

Sumac or its derivatives can be used to dye a very large variety of shades, most of which are absolutely fast to all influences, such as slates, greys, drabs, modes, blues, blacks and greens. It is also used as a bottoming in conjunction with tin salts, for yellows and reds and purples of the dyewoods.

The following process for dyeing black will enable us

to illustrate some of the reactions of sumac in connection with metallic bases:

The goods are put into a hot decoction of sumac and allowed to steep for 12 hours; they are then wrought through lime water, which gives them a beautiful bluish green color, becoming very dark with a short exposure to the air. If allowed to stand for half an hour, the green color passes off, and the goods assume a greenish dun shade. When they are at the darkest shade of green, they are put through a solution of copperas; after cooking in this, and exposing them to the air they become black. But if dried from the copperas the color is only a slate or dark grey. They are now put through lime water, which renders them brown; then worked in a weak solution of logwood and raised in a weak copperas liquor to blue the color and clear it. The goods are washed from this in cold water, and dried in the shade. This makes the fastest and best black known and the writer has samples dyed in this manner 42 years ago that look as good as ever, while all other blacks dyed at the same period and pasted in the same book, including the oxidized and all other aniline blacks are faded more or less and their beauty gone.

Sumac has a stronger affinity for the cotton fibre when cold, or comparatively so, therefore it is used hot so as to penetrate the fibres better and then allowed to remain 12 hours in contact with the goods so as to get cool—this is important.

The passing of the goods from the sumac through lime, before putting them into the iron solution, is not essentially necessary for producing the color, the writer has produced good blacks without this operation, but it is very useful in facilitating the precipitation of the iron mordant and in giving a greater depth to the color on this account. The iron is held by the strong affinity of the acid, but the goods impregnated with lime, being put into the copperas, the lime combines with the acid and the iron combines with the gallo-tannic acid of the sumac. The passing through lime water from the copperas solution is for the purpose, also, of neutralizing the acid of the iron and precipitating the iron upon the goods, which as a salt, would act upon the logwood solution and precipitate it in the bath to the injury of the color. If the goods are passed into the logwood from the lime without washing the free lime is hurtful to the logwood, therefore it is best to wash the goods well from the lime before putting them into the logwood. The action of the iron upon logwood is the same as with sumac; a persalt of iron gives an immediate black, but it is not permanent, the oxygen seeming to effect the decomposition of the color in some way. When a proto-salt of iron is used, however, such as copperas, the blackening is slower, but more permanent. It is, however, to be remarked, that the combination of iron and tannin forming the black color, seems to depend on a state of oxidation of the iron a little higher than the protoxide, and much lower than the peroxide; and that the peroxide, when used, is reduced in oxidation and causes change and loss in reduction, and that the protoxide imbibes oxygen as required. This might indicate that some mixture of the two would be the most advisable to use.

It has long been known that tannin or gallic acid do not precipitate the protosalts of iron when protected from contact with the atmosphere; it has been observed, however, that when tannin or gallic acid is conveyed into a salt of the peroxide of iron it is always reduced to the state of a protosalt and it is probable that the oxygen combining with the tannin converts it into a new acid of a blue color.

When a solution of tannin or gallic acid is poured slowly into a solution of persulphate of iron in excess, no blue coloring is obtained; but if a solution of tannin or gallic acid in excess is conveyed into persulphate of iron, and the liquid thrown down by acetate of lead, a blue paste is obtained, which, treated wth oxalic acid forms a soluable oxalate of iron. Similar oxalates can be formed with the lakes of some of the other vegetable dyestuffs and a wide range of absolutely fast colors or shades can be obtained by simply mixing them in various quantities and strengths of solution and passing the goods through the liquor on a padding machine and from that through a short ager containing ammonia gas which neutralizes the oxalic acid and raises the color.

From very deep to delicate light shades of slates, drabs, modes, etc., all possessing great beauty and fastness can be dyed and raised at one operation by this process. All shades of slate from the darkest to a light pearl can be dyed with the sumac alone and by mixing these with yellow, and red from bark and the red dyewoods made soluble in the same way a vast variety of shades can be obtained.

Gallo-tannic acid is almost insoluble in ether, but readily soluable in alcohol and water. It is precipitated from its aqueous solution by many of the stronger acids, and also by various salts, such as common salt, salammoniac and potassium acetate. When boiled with baryta water it yields barium gallate and glucate. It yields gallic acid and glucose when boiled with dilute acids, but this gallic acid can be reconverted into tannic acid by heating its concentrated aqueous solution with arsenic acid. In presence of alkalis, tannin absorbs oxygen from the atmosphere, and is converted into a red substance called *rufitannic acid.*

Gallic acid possesses no dyeing value but if heated to 410 degrees F. it splits up into carbon anhydride, and a beautiful white crystalline compound called pyrogallol.

Pyrogallol has acquired considerable importance of late years from the extensive use which has been made of it as a reducing agent in photography, and also from its application to reduce the metallic salts used with hair dyes. It is very soluable in water and somewhat less so in ether. It imparts an indigo blue coloration to the proto salts of iron, and a red coloration with the persalts, but no precepitate is formed and so it is useless for dyeing purposes; with lime water it gives a fine purple color, which, however, is very fugitive.

By treating a mixture of pyrogallol with phthalic anhydride to 390 degrees F. for several hours, a red dye is produced very similar in its properties to hematein; this is called *Gallein.* As soon as the reaction is complete, which is known by the mixture becoming thick, it is allowed to cool, then dissolved in boiling alcohol, filtered, and the filtrate poured into a large quantity of water. The brown precipitate of nearly pure gallein thus produced, may readily be obtained in a crystalline state by dissolving it in hot dilute alcohol and allowing the solution to cool.

Gallein is almost insoluable in cold water, and but little soluable in hot water, yielding, however, a red solution. It dissolves readily in alcohol, and also, in alkaline solutions, the latter having a splendid blue or violet color. Gallein, when treated with reducing agents, such as zinc and sul-

phuric acid, is converted into a colorless compound, called gallin, just as hematein is converted into hematoxylin. The gallein should be boiled with a large quantity of water and some sulphuric acid and zinc until the liquid becomes yellow. On cooling, oily drops separate, which soon solidify to a crystalline mass of impure gallin.

The colors which gallein gives on cloth mordanted with alumnia or iron have a bluer tinge than those obtained with logwood, but are finer and much more stable, resembling those of barwood. With a lead mordant it produces a brilliant violet blue, which is very fast to soap. Similar colors are produced by gallin.

CAERULEIN.

Caerulein is formed when gallein is heated with twenty times its weight of concentrated sulphuric acid to 390 degrees F.; the red color which the solution has at first, gradually changing to a greenish brown. When the reaction is terminated—which may be known by a sample giving dark flocks when treated with water, but without coloring the solution. The product is poured into a large quantity of water, and the voluminous, nearly black precipitate thoroughly washed with hot water. The precipitate, which consists of pure caerulein, has a composition represented by formula C_{20} H_{10} O_7, and its formation from gallein may be represented thus:

$$\underset{\text{Gallein}}{C_{20}\ H_{12}\ O_7} = \underset{\text{Caerulein}}{C_{20}\ H_{10}\ O_7} + H_2$$

When dry it forms a bluish-black mass, which is but very slightly soluable in water, alcohol, or ether; it dissolves readily, however, in hot aniline, with a magnificent blue color, and this solution when diluted with alcohol and slightly acidified with acetic acid, dyes wool indigo blue. Caerulein dissolves in alkaline solutions with a beautiful green color, which is unaltered by exposure to the air, and yields green lakes, of extreme fastness, with the earths. Cotton mordanted with alumina is dyed a fine green in a bath of this color, whilst with iron mordants a brown is obtained. These shades resist soaping extremely well and rival the old style madder colors in their extreme fastness.

Sumac varies considerably in value, some containing much more tannin than others and it is indispensable that it should be tested when bought to ascertain its value. A new method for the estimation of tannins is suggested by P. Wilhelm. It rests upon the preciptiation of a methylene blue solution of known proportion. The sumac or tannin solution, when cold, is allowed to run into a solution of methylene blue containing ammonia.

Methylene blue, 12½ grams, free from zinc, is dissolved in distilled water, and the solution raised to one liter. The tannin solution is prepared with 19.6 grams and this is also raised to one liter. Twenty c. c. of the methylene blue solution is then put into a beaker; 10 c. c. of 12½ per cent ammonia is added, and then from a burette the tannin solution is run in, until all the methylene blue is precipitated. The end of the reaction is found by using drops of the methylene blue solution on a filter paper, when the filtrate should not be colored. Ten grams (80 per cent) methylene blue corresponds to 4.9 grams pure tannin.

To distinguish gallic from tannic acid, I would suggest the following procedure. Gallic acid in ammonia water produces a salmon red color, and this is altered to a deep red upon the further addition of nitric acid, and no precipitate is made even after some time. The same treatment with tannic acid, produces a flocculent precipitate after the addition of ammonia. I have before me at this writing sample books containing samples of cotton goods dyed various shades with sumac by the writer when superintendent of the Bondsville Dye Works and manager of the Canada Cotton Co., forty years ago and these shades—slates, drabs, modes, greens, blues, yellows, reds, etc., are just as full and fresh today as the day they were dyed. Many of these were dyed by the ammonia and oxalate of the tannates of iron and alumina process, and many of them by the aid of tin spirits and similar mordants and mixtures and all are fast or faster than the ordinary direct anilines of today.

The Hydrosulphites in Cotton Dyeing.

BY A. F. MUSGRAVE.

The stable hydrosulphite compounds, which are on the market today, play a very important part in the dyeing, bleaching and printing of cotton goods and sometimes, owing to the different varieties of these compounds, a confusion exists as to the best product for a particular purpose. For instance, whereas the dyer of long ago used only the straight sodium hydrosulphite which he prepared in his plant by the action of zinc dust on bisulphite of soda, there are now on the market several varieties of the stable hydrosulphites all of which are characterized by different properties. The advent of the vat dyes has added a great impetus to the manufacture of stable hydrosulphites as these products are necessarily used in the dyeing of this class of colors. While it is of course possible to use zinc dust and bisulphite of soda for the reduction of vat dyes it will be found that the use of the proper stable hydrosulphite, in powder form, is much easier and gives a bath which is freer from sediment.

Sometimes a dyer has the bad fortune to get over his shade when dyeing and must of necessity reduce the depth of color. Unless the job is a very bad one it can generally be fixed up by the aid of dilute boiling alkalies, provided that the dye used is of the ordinary direct class but when goods which are to be redyed do not lighten sufficiently with this simple treatment they must be treated to something stronger and that means either a bleaching with chlorine or a discharge with hydrosulphite. There are many dyes which are not appreciably lightened by a stripping with hydrosulphite and very few dyes which are not destroyed by chlorine, but at the same time it is always better whenever possible to make use of the stripping method rather than the bleaching action.

Another use to which the hydrosulphites may be put with good advantages, is when bleaching low grade stock which often contains small specks of colored cotton and which are sometimes unaffected by the treatment with chlorine. A treatment of these goods with a hydrosulphite will generally clean them so that a good white may be obtained in the bleaching process. The writer knows of a concern who was engaged in the bleaching of knit goods in the roll and who never used a caustic or soda ash boil but simply boiled the goods out with hydrosulphite and then after a rinse proceeded with the chlorine bath. It was claimed at that time that this method of bleaching gave an excellent

white and that the goods only shrunk about one half as much as when subjected to a regular caustic boil bleach. These goods were bleached in the open kettles but there can be no reason why the process could not have been successfully carried out in a kier although there is the possibility that the goods would become stained due to the action of the hydrosulphite on the metal parts of the kier. In the case of the concern mentioned, the factor which started the bleaching in this manner was the great number of colored specks in the goods, these specks not being sufficiently removed by the caustic boil.

In order to make use of the hydrosulphites in an intelligent manner it is first necessary to understand the manner in which they work. As every chemist knows, there are two great actions which are constantly going on in nature. One of these is known by the name of oxidation while the other is known as reduction. As an every day example of the process of oxidation we have the rusting of iron while the assimilation of carbon from carbon dioxide, by growing plants, is a typical example of reduction as it occurs in nature. It will thus be seen that the process of oxidation consists in adding oxygen or taking hydrogen away from a compound and that the process of reduction is exactly opposite, namely taking away oxygen or adding hydrogen. This typifies the difference between the action of hydrosulphite and the action of the ordinary bleaching agents which are in use for cotton, as all bleaching agents which are used for cotton are of the oxidation type, while all hydrosulphites are reducing agents. This explains its value as a stripping agent, for low grade goods, preliminary to the bleaching process as it will generally be found that colors which are very fast to an oxidizing action are much weakened by the action of reducing agents.

In the discharge printing of cotton goods a large amount of hydrosulphite is used and it is only by the use of the stable hydrosulphites that it has been possible to manufacture the beautiful examples of discharge work which are on the market. Also in the printing of both vat and sulphur colors hydrosulphite is used. The variety of hydrosulphite compound which is used for discharge work is different in its chemical composition and properties to that which is used for stripping or dyeing and with few exceptions it will be found that members of one group of hydrosulphites cannot satisfactorily be substituted for members of another group. The following are the varieties of stable hydrosulphite compounds which are on the market at the present time and also tests for their distinction from members of another group.

The hydrosulphites are popularly designated under three names, dyeing, stripping and discharge groups. This classification refers to the purpose for which they are generally used and is rather misleading as certain members of the class may be used to good advantage in doing the work of another group. The classification according to the chemical names is as follows. Sodium hydrosulphites, zinc formaldehyde sulphoxylates and sodium formaldehyde sulphoxylates. The sodium hydrosulphites which correspond to that hydrosulphite prepared from zinc dust and bisulphite of soda, are white powders which dissolve in neutral, alkaline or acid solution although their greatest reducing power is exerted in neutral or alkaline baths. The products of this class, of which there are several with minor differences of composition, are extensively used in the dyeing of indigo and the vat colors, printing of vat colors as well as the stripping of dyed goods. When used for the dyeing of vat dyes they are used in an alkaline bath, when used for the stripping of dyed goods they may be used in a bath which is either neutral or slightly alkaline. The hydrosulphites of this class are more liable to become decomposed on storage than members of the zinc group but it is this rapid decomposition which makes them valuable for dyeing. By this is meant that the zinc compounds being insoluble except in acid solution and at an elevated temperature could not be used for dyeing purposes owing to the high temperature at which they exert their reducing action. Some of the commercial names of members of this class are Hydrosulphite conc., Blankit T., Burmol, Hydralite conc., etc.

The introduction of zinc and formaldehyde into a hydrosulphite gives a product of grayish color which is insoluble in neutral or alkaline solution but which readily dissolves with the organic or mineral acids. As before stated, this prohibits its employment in dyeing and the members of this class are without exception used for stripping dyed goods. It was stated that members of the dyeing or sodium hydrosulphite group could be used to good advantage for stripping and I have found that the members of this group are excellent for stripping colors from cotton goods while the zinc compounds which must be used in an acid bath are better suited to the stripping of wool and union goods. The commercial names of members of the zinc formaldehyde sulphoxylate series are Hydrosulphite AZ, Stripper AZ, Hyraldite Z, Decroline, etc.

The introduction of formaldehyde alone into a hydrosulphite gives a product which is characterized by more stability than the straight sodium compound and yet is not as stable as the zinc products. This sodium formaldehyde compound is soluble in either neutral, alkaline or acid baths but exerts its reducing action only in neutral or acid solution. The members of this class are therefore used for discharge print work. Certain of the hydrosulphite compounds of this class contain some white filling matter which is added in order to improve the white discharge. This filling matter is generally an insoluble, white pigment. As the sodium formaldehyde sulphoxylates are active in acid solution they may be used for stripping in that manner. The compounds of this class are known under such names as Rongalite C, Hyraldite C, Hydrosulphite NF, Hyraldite CW, etc.

STRIPPING WITH THE HYDROSULPHITES.

The best method for the stripping of cotton goods by the use of the straight sodium hydrosulphites is as follows: The sodium hydrosulphite, from 2 to 4 per cent is sprinkled into the bath, the goods entered and steam turned on. It will be found that a great action will be exerted before the bath has come to the boil and often the goods will have been sufficiently lightened at or around 170 degrees F. Another method consists in the addition of 2 per cent of soda ash to the hydrosulphite bath, such an addition also assisting in removing the color. After the goods have become sufficiently stripped they should have two rinses of warm water in order to free them from the sulphur smell.

When using the zinc compounds for stripping, the powder from 4 to 7 per cent is sprinkled into the bath, which has previously been acidified with from 2½ to 5 per cent formic acid or 3 to 6 per cent acetic acid or 1 to 2 per cent sulphuric acid. These different acids are all in use but sul-

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COTTON MACHINERY

Opening and Picking Machinery

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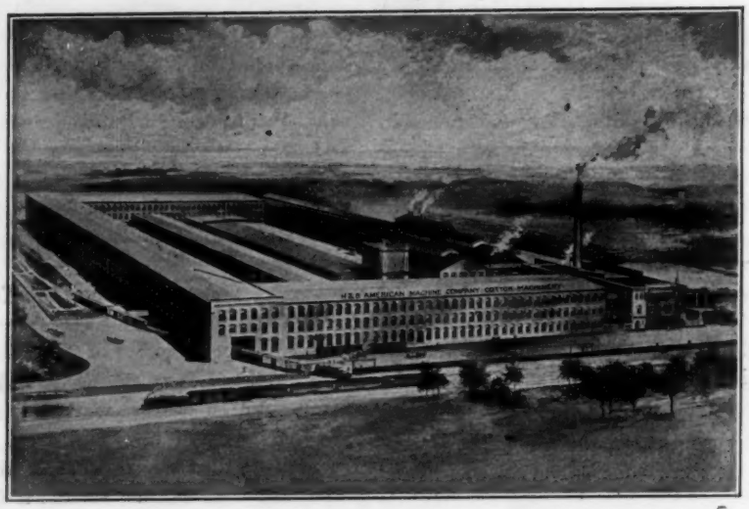


Spinning Room Machinery

Twisters for Wet or Dry Work

With Band or Tape Drive

H. & B. AMERICAN MACHINE COMPANY
PAWTUCKET, R. I.

phuric acid has a tendency to decompose the product too quickly and to give rise to a very unpleasant odor. The powder is well stirred into the bath, the goods entered and the bath brought very slowly to the boil. If the color has not been lightened sufficiently at the boil more acid may be added and the boiling continued for twenty minutes, after which no further reduction will take place. The goods are then given one cold and one hot rinse, a small amount of soda ash sometimes being added to the first rinse.

If it is desired to use the sodium formaldehyde sulphoxylates for stripping it is necessary to use acetic acid and to work in the same manner as when using the zinc compounds.

Three new bulletins have just been received from the Spray Engineering Co., 93 Federal St., Boston, Mass. "Spraco System for Cooling Condensing Water" is the title of one of these booklets, which devotes 16 pages largely to well finished half tone illustrations of installations of the "Spraco" equipment already in service in different parts of the country. "Cooling Water for Ice Plants" is the name of another of these little folders; while the third is devoted entirely to a description of the Vaughn Flow Meter. This latter is a simple and efficient instrument for indicating the flow of liquid in pipes. It is applicable to a large number of commercial systems such as cooling, heating, lubricating, refrigerating, boiler supply and various other manufacturing purposes. Any or all of these bulletins may be secured from the Spray Engineering Co., upon application.

Dyeing Materials in the Philippines.

There are sources of natural dyestuffs in the Philippine Islands, yet it is doubtful if they will attain much commercial prominence. Probably more than 100 species of plants containing valuable color principles are found in the Philippines, and many more undoubtedly could be readily cultivated. In many cases the colors produced are inferior in quality, being either fugitive or not clear. As the plants that yield dyeing materials grow wild and often are widely scattered, the supply is unreliable and insufficient. Little has been done toward developing the manufacture of local coloring materials, and until there is an intensive cultivation of the necessary plants, and the capital necessary for the enterprise can be secured, there is little prospect of commercial success.

Only two Philippine dye plants are commercially important. These are indigo and sappan or sibucao. Others are used locally, but scarcely enter into domestic commerce, much less into the external commerce of the archipelago.

Indigo (*Indigofera tinctoria* Linn. and *I. suffruticosa* Mill.), locally known as tayum, tayom, tagum, pauay, tayum-tayum, and tagung-tagung, has been in the past extensively cultivated in some parts of the Philippines, and the prepared product entered extensively into the export trade. With the development of the coal-tar dye industry and the manufacture of artificial indigo, however, the cultivation of indigo as a commercial crop in the islands practically ceased. Indigo is still cultivated on a small scale in some parts of northern Luzon, but only to supply a limited

local demand for blue coloring matter. It is possible that the extraction of natural indigo might be profitable at present, but the rehabilitation of the indigo industry would take time and a considerable investment of capital in extraction vats, with the practical certainty that at the close of the war the industry would suffer from the competition of coal-tar products.

Sappan or sibucaco (*Coesalpinia sappan* Linn.) is a shrub or small tree, and is widely distributed in the settled areas of the Philippines, at low and medium altitudes. It is not systematically cultivated, yet in a few districts, such as Guimaras Island and parts of Panay, it is found in great abundance. In general, it appears only as a widely scattered tree. It has valuable properties and yields a red dye. The wood is annually exported in considerable quantities to southern China.

Exports of sappan wood from the Philippines to China, exclusive of Hongkong, in 1914 amounted to 1,515,756 pounds, valued at $6,537, and to Hongkong amounted to 621,597 pounds, valued at $2,857. During 1913 the exports to China, exclusive of Hongkong, amounted to 1,173,036 pounds, valued at $4,417, and to Hongkong, 1,358,258 pounds, valued at $4,707. No sales to other countries are on record.

This wood yields about 2 per cent of coloring material by extraction with water. For the export trade, the color should be extracted from the wood and the water evaporated, thus reducing freight charges. This wood contains brazilin, the coloring matter found in brazilwood. Brazilin is not a fast dye, and an objection to it is that it is very sensitive to acids and alkalis.

Brown dyes are obtained from numerous plants, chiefly from the shrub or small tree known as bancudo, or nino (*Morinda indica* Linn.), certain of the mangrove trees, such as ceriops and bruguiera, the bark of xylocarpus (tabigue or nigui), and from numerous others less important. Many of these barks are useful in tanning as well as in dyeing.

Bancudo is the well-known al dye of India. It requires the use of a mordant, since it does not dye cotton directly. Cotton mordanted with tannin is colored dark red by bancudo.

Black dyes are secured from *Heritiera litoralis* Dry. (dungon late), a common coastal tree; and from some species of *Hibiscus, Semecarpus, Terminalia.* and *Diospyros.* The determining character in most cases is the presence of tannin in large quantities.

Yellow dyes of minor importance are secured from the seeds of *Bixa orellana* Linn. (achuete); from the wood of *Nauclea* (bancal); from *Carthamus tinctorius* Linn., which is occasionally cultivated as a dye plant; from the bark of the common mango; from some species of *Vitex* (molave); and from ligtang, a woody vine having yellow wood rich in berberine.

Berberine is found in several plants of the Philippine Islands. Cloth dyed with it does not show as bright a yellow as that dyed with turmeric, but it has the virtue of being much faster to light than the latter.

Turmeric (*Curcuma longa* Lam.), locally known as dilao, is an herbaceous plant of the ginger family. The yellow fleshy rootstocks are utilized for dyeing yellow, but the color soon fades. The plant does not occur in sufficient quantities in the Philippines to yield a useful supply of the rhizomes. However, its cultivation is a simple matter, and it can be propagated very readily. It is extensively cultivated in parts of India, but chiefly for its value as a constituent part of curry powder. In the Philippines it needs cultivation and exploitation to become of commercial importance.

Peristrophe tinctoria Nees, an herbaceous plant widely scattered in the settled areas in the Visayan Islands and sometimes cultivated on a small scale, yields a beautiful red dye, which is locally utilized in the Philippines. The parts used are the tender shoots and young leaves. This material can be crushed in a mortar and the resulting pulp dried and preserved for future use. It is very doubtful that the plant can be obtained in sufficient quantities or that its commercial utilization is possible. It is known as deora, taoda, and calaora in Mindanao and Negros.—*Commerce Reports.*

An Industrial Welfare Number.

The August number of "The Modern Hospital," a magazine published from St. Louis and Chicago, is devoted to a symposium on welfare work among the industrial corporations of the country. There are a number of papers written by welfare directors in some of the more important industrial corporations, and statistics, figures and facts showing the volmue of work that the corporations are doing in the interest of the welfare of their employees. The journal contains many illustrations of welfare features in corporation plants, and many facts that should be of great help to those interested. Among the topics discussed are those of first aid, industrial nursing, lunches and diets for industrial employees, safety devices in factories, and athletic and social clubs for employees. The editors frankly state that they have been unable to obtain figures as to cost of welfare work in the industries, but a number of writers attempt to make deductions and draw conclusions from their experiences of the past few years.

"The Modern Hospital" divides welfare work into three phases:

1. To make employees healthy, comfortable, and happy, in order that they may achieve the highest efficiency in their work.

2. To help employees prepare for the day when they are prevented from being bread winners, so that dependents on them may be provided for in case of sickness or disability.

3. To provide entertainment, recreation, and interesting groupings, in order that the employees of the corporation may have mutual interests which will enhance their loyalty and team-work.

Perhaps the best feature of the industrial number of "The Modern Hospital" is the attempt on the part of the editors to weed out those features of industrial welfare that they believe undesirable and to emphasize those that seem to best meet the present demands of the American public.

An American consular officer in Norway writes that a merchant in his district desires samples and quotations on American stockings (wool, cotton, and silk) and on white piece goods (linen, etc.) Correspondence may be in English. Reference. In writing to the Department of Commerce at Washington, refer to file No. 22002.

Barrett Specification Roofs

Guaranteed for 20 Years

No Upkeep Cost for 20 Years —*Absolutely Guaranteed*

Here are details of a plan to guarantee your roof for 20 years, *at no extra cost.*

It is a new feature of Barrett Service. We know from an experience of over half a century that a Barrett Specification Roof, *if properly laid by a good roofing contractor,* will last at least 20 years. Scores of roofs of this type have lasted almost twice that period.

In order that purchasers may have the benefit of this experience we have arranged with one of the largest Surety Companies in America—The United States Fidelity & Guaranty Company of Baltimore—to issue hereafter, a 20 year Guaranty Bond on all Barrett Specification Roofs of 50 squares or more in all towns in the United States and Canada of 25,000 population and over—*and in smaller places where our Inspection Service is available.*

Our only requirements are that the roofing contractor shall be satisfactory to us and that the specification dated May 1, 1916, shall be strictly followed.

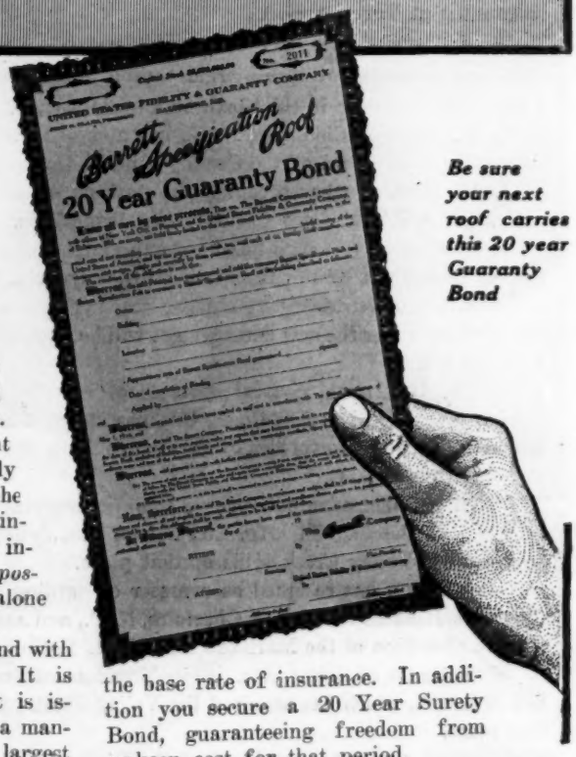
All you have to do to secure the 20 Year Guaranty Bond is to give the roofing contractors copies of The Barrett Specification *of that date,* and tell them to figure on that basis.

From the buyer's standpoint the arrangement is practically ideal. for under the plan the owner is assured of having an inspector on the roof whose only interest is to make it as *good as possible*—for if it isn't right we alone are the loser.

Do not confuse this Suroty Bond with the ordinary "Guarantee." It is something quite different. It is issued, not by an individual or a manufacturer, but by one of the largest and best known Surety Companies in the country and is *a legal, workable document that has no loopholes.*

When you give the roofing contractor a copy of The Barrett Specification of May 1, 1916 to figure on, you are ordering the very best roof it is possible to construct and one that takes the base rate of insurance. In addition you secure a 20 Year Surety Bond, guaranteeing freedom from upkeep cost for that period.

If you are interested and want further information, write our nearest office.



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The Barrett Company

Largest Manufacturers in the World of Roofing and Roofing Materials

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St. Louis Cleveland Cincinnati Pittsburgh
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Minneapolis Salt Lake City Seattle Peoria
The PATERSON MFG. CO., Limited, Montreal
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St. John, N. B. Halifax, N. S.
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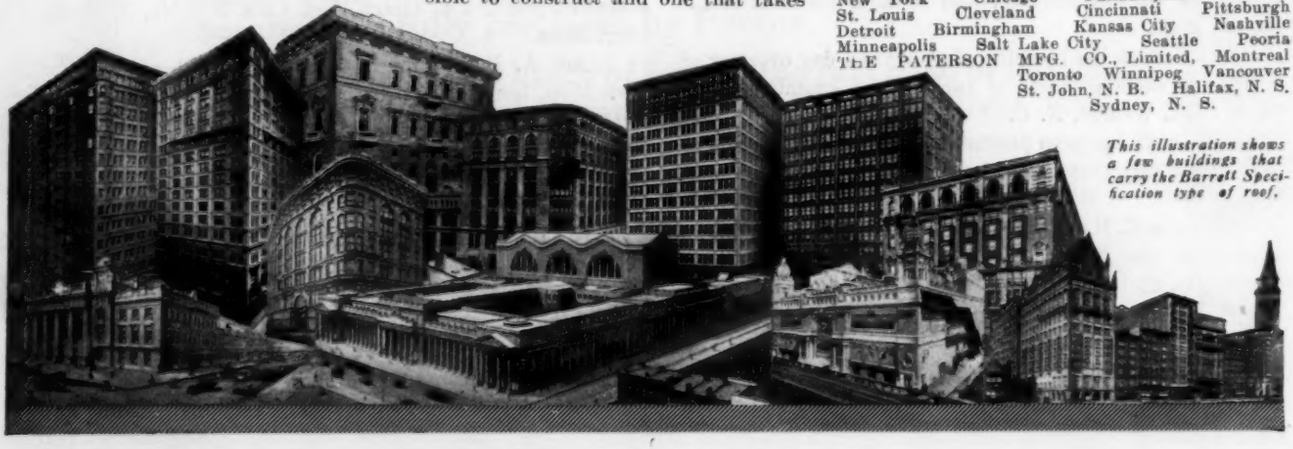

This illustration shows a few buildings that carry the Barrett Specification type of roof.

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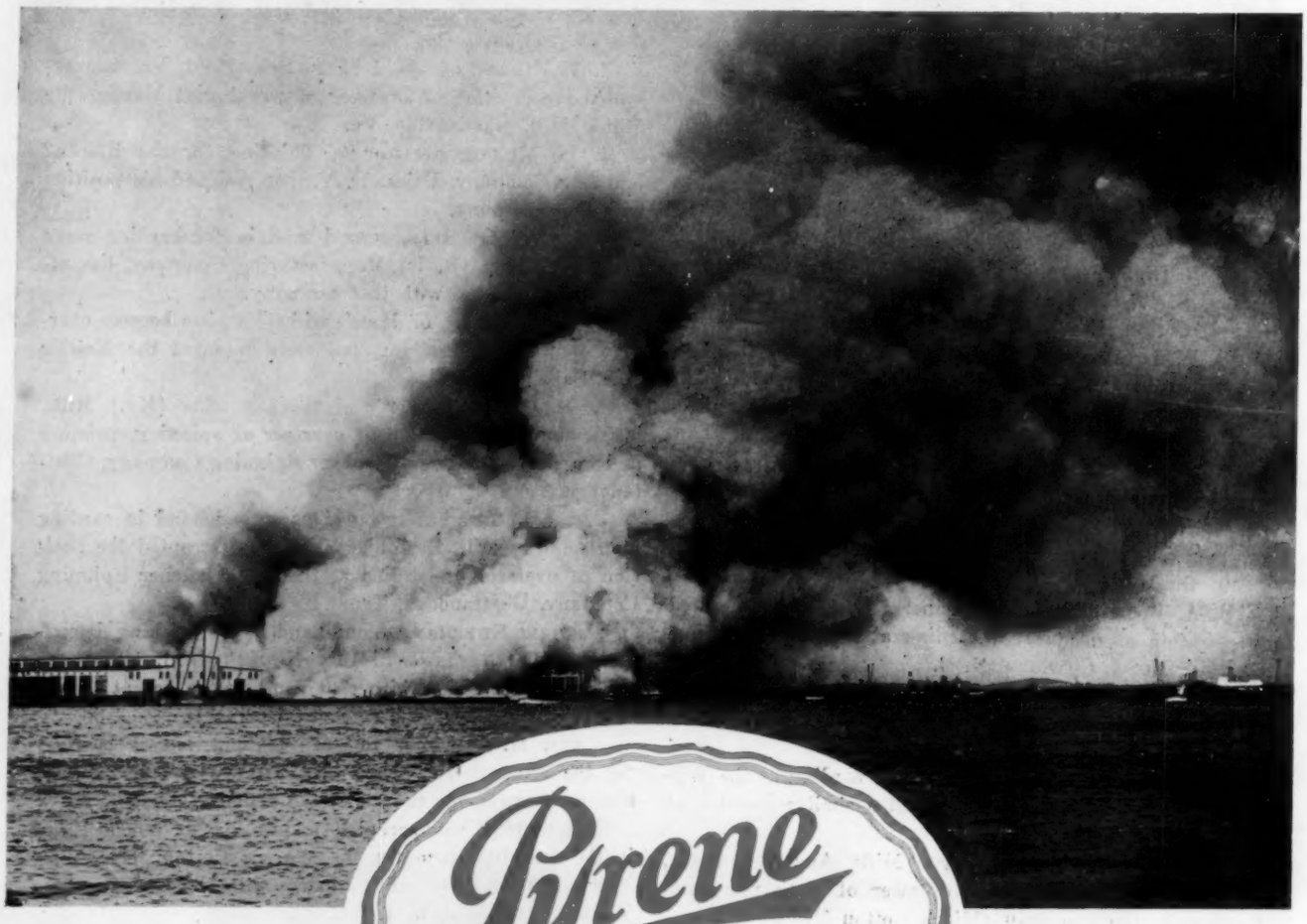
GEO. E. ELIOTT, overseer of ring spinning at the Shetucket Manufacturing Co., Norwich, Conn., has accepted the position as overseer of ring spinning, spooling, winding and



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JAMES A. DODD, superintendent of the Phenix (R. I.) Lace Mills, has taken up his residence in his summer home at Oakland Beach.

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J. B. HAWKINS has resigned as superintendent of the Magnolia Mills, Charlotte, N. C.

J. S. STROUD of Stonewall, Miss., will be assistant manager of the Erwin Cotton Mills, Cooleemee, N. C.

GEO. E. ELIOTT, overseer of ring spinning at the Shetucket Manufacturing Co., Norwich, Conn., has accepted the position as overseer of ring spinning, spooling, winding and

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The great Pacolet Cotton Mill of New Holland, Ga., will never burn like this. Fires can't grow big in this plant, because it is fully protected by Pyrene.

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dressing at the Mohawk Division of the Utica (N. Y.) Steam & Mohawk Valley Cotton Mills.

B. HOLDEN, formerly superintendent of carding at the mills at Jacksonville, Ala., is now located at Easthampton, Mass.

L. W. SINCLAIR has resigned as night overseer of spinning at the Fidelity Mills, Charlotte, N. C., and accepted a similar position at the Wadesboro (N. C.) Cotton Mills.

R. H. SMITH has accepted position as superintendent of the Mississippi Cotton Mills, Morehead, Miss.

T. W. HARVEY of Cherryville, N. C., has accepted the position of superintendent of the Hardin Mills, Worth, N. C.

W. B. HOLT has resigned as overseer of weaving at Anderson, S. C., to become superintendent of the Stonewall (Miss.) Cotton Mills.

W. W. HAMMOND has resigned as overseer of Nos. 1, 2 and 3 carding at the Pelzer Mfg. Co., Pelzer, S. C., to become overseer of carding at the Mills Mill, Greenville, S. C.

T. W. HADDLE, JR., has resigned his position as overseer of spinning at the Courtenay Manufacturing Company, Newry, S. C., and accepted his former position as overseer of spinning at Martel Manufacturing Company, Egan, Ga.

B. A. ROBERTSON, of Bladenboro, N. C., has accepted the position of overseer of carding at the Chadwick-Hoskins Mill No. 4, Charlotte, N. C.

R. G. MILLS has been promoted to overseer of weaving and the rope department of the Anchor Duck Mills, Rome, Ga.

J. R. MANLY, formerly overseer of carding at the Williamston(S. C.) Mills, has accepted a similar position at the Seneca (S. C.) Mills.

M. W. HOLLIS, of the Brogon Mills, Anderson, S. C., has accepted the position of overseer of cloth room and finishing at the Stonewall (Miss.) Cotton Mills.

R. T. SMITH has resigned as night overseer of spinning at Banning, Ga., to accept a similar position at Villa Rica, Ga.

GEORGE RAWSON, foreman of the yard help at the Ashton (R. I.) Mill of the Lonsdale Company, has resigned his position, to take a similar one at the plant of the Lorraine Manufacturing Company, Pawtucket.

H. T. GODFREY has accepted position as overseer of spinning at Fairmont, S. C.

J. O. MOORE has been promoted to overseer of spinning at the French Broad Manufacturing Company, Asheville, N. C.

CHARLES LOCKMAN has resigned as overseer of spinning at the Jewell Mills, Thomasville, N. C., to accept a similar position with the Cabarrus Cotton Mills, Concord, N. C.

J. W. BOUNDS, overseer of the No. 3 weave room, Cannon Mills, Kannapolis, N. C., will also take charge of the No. 4 weave room, which will be operated on terry towels.

J. T. NANCE, overseer of carding and spinning in Cannon Mill No. 3, Kannapolis, N. C., will also take charge of No. 4 carding and spinning on the day run.

J. C. BAKER has been promoted from second hand in night spinning in Cannon Mill No. 3, Kannapolis, N. C., to night overseer of spinning in Mill No. 4.

J. A. SHIPES has resigned as overseer of spinning at Fairmont, S. C., to accept a similar position with the Phoenix Mills, Kings Mountain, N. C.

WM. WILLIAMS has resigned as night overseer of carding at Cannon Mills No. 4, Kannapolis, N. C., to accept a similar position at the Johnston Mill, Charlotte, N. C.

F. G. BECKNELL has resigned his position at the Anchor Duck Mills, Rome, Ga., and accepted a similar position at LaGrange, Ga.

J. W. BYARS, of No. 4 Mills, Schoolfield, Va., has accepted the position of overseer of weaving at Martinsville Cotton Mill, Martinsville, Va.

J. H. MILLER, overseer of finishing for the Elboeuf Knitting Company, Utica, N. Y., has resigned his position with that company.

WILLIAM MITCHELL, second-hand in the carding room for the Warren (R. I.) Manufacturing Company, has resigned his position with that company.

L. F. WILLIAMS, of Martinsville, Va., has become overseer of weaving, slashing and cloth room at the Kestler Mill, Salisbury, N. C.

R. P. CLARK, formerly of the Louisville (Ky.) Mills, has accepted the position of overseer of spinning, twisting and warping at the new Thatcher Spinning Company, Chattanooga, Tenn.

J. B. HORTON has resigned as second hand in carding at the Loray Mill, Gastonia, N. C., and accepted the position of overseer of carding at the new Thatcher Spinning Company, Chattanooga, Tenn.

MICHAEL SHEEHAN, second-hand in the finishing department of the Nashawena Mills, New Bedford, Mass., has resigned his position with that company to accept one in charge of finishing for the Nonquitt Mills.

CHAS. M. KENNETT resigned his position as overseer for the Suncook (N. H.) Mills. He has accepted a position as overseer for the Lockwood Mills, Waterville, Me.

FRED ROYLE has accepted a position as second hand in the finishing room for the Warren Cotton Mills, West Warren, Mass. He was formerly with the Glenlyon Dye Works, Saylesville, R. I.

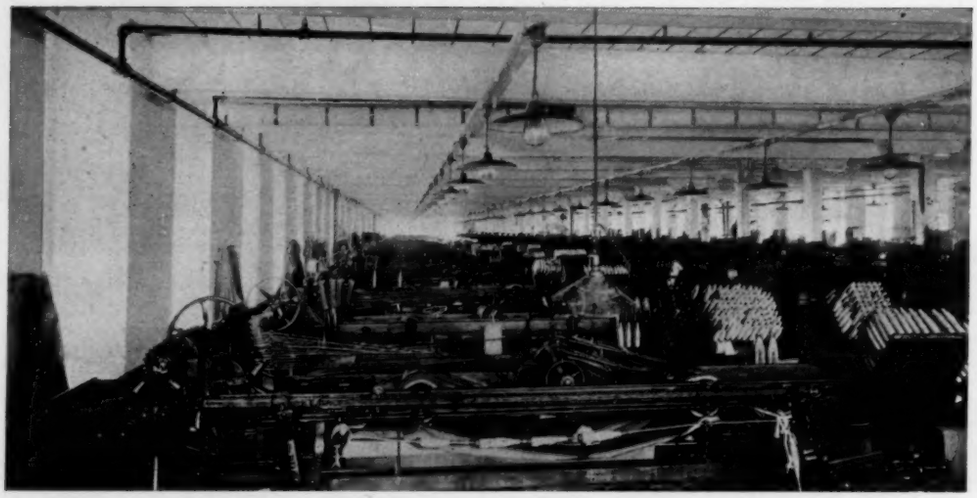
ZEB GRAY, of Gastonia, N. C., has accepted the position of overseer of spinning at the two mills of the Republic Cotton Mills, Great Falls, S. C.

Do You Believe in Signs?

The Wolfson Tray Co., of Columbus, Ga., manufacturers of Wolfson sanitary paper cuspidors, have prepared seven reversible signs, one for every day in the week and with another week to follow, all tending toward one end, viz. that "Spitting is a bad habit at best, but, if you must spit, use the cuspidor." This is quoted from one of the signs, but they all point the same moral. They are printed in colors on heavy white card-board, and it is understood that a package of these accompany each shipment of their sanitary cuspidors, whether large or small. "The corners and the dark holes are not the proper places to spit. Use the cuspidor."

Better Electric Motors is the title of a new 62-page illustrated booklet just issued by the S. K. F. Ball Bearing Company, of Hartford, Conn. This interesting booklet, which was published by Harper and Brothers, New York, contains over 160 illustrations of the construction and different applications of S. K. F. ball bearings in different classes of work. It is practically an encyclopedia of ball bearing uses.

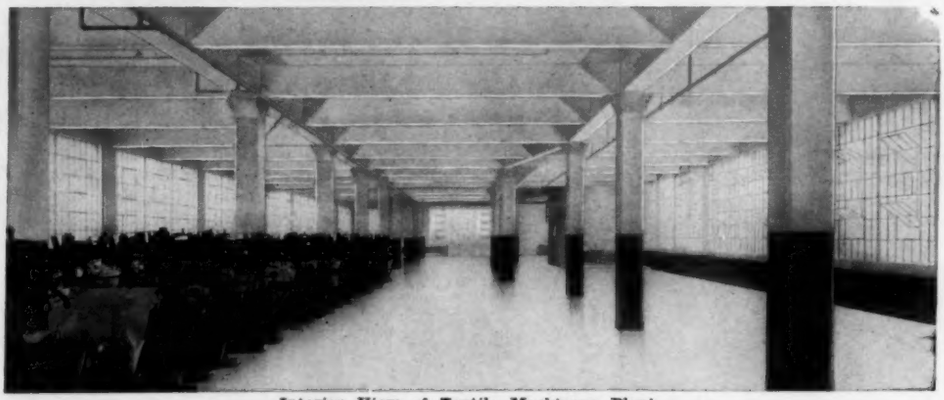
CHAFFEE'S MILL WHITE MAKES DAYLIGHT



Interior View of Worsted Mill.

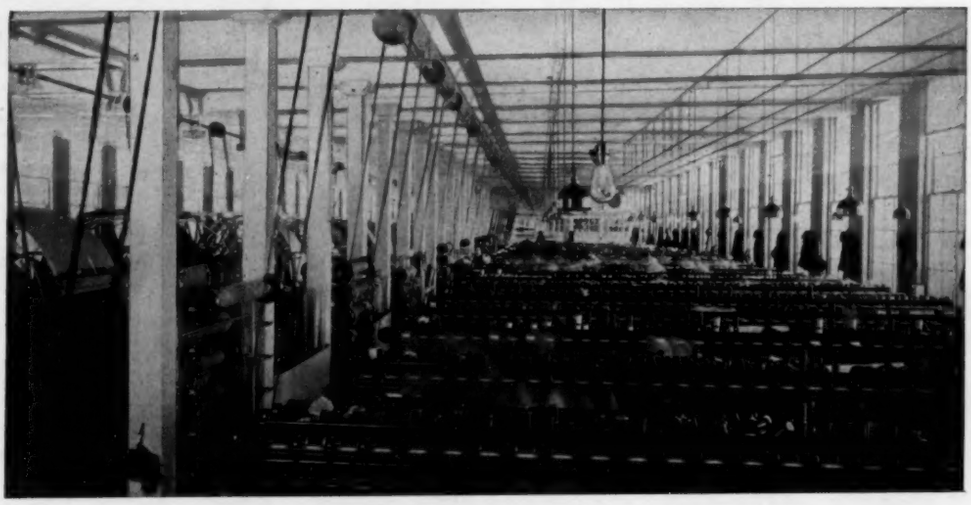
CHAFFEE'S MILL WHITE

A PERMANENT, LIGHT-DIFFUSING PAINT FOR THE FACTORY INTERIOR
ADDED LIGHT—LOWEST ULTIMATE COST—SANITARY FINISH



Interior View of Textile Machinery Plant.

Wouldn't it pay you right now to investigate the merits of this Sparkling, Shadow-chasing White Paint, which has proven its efficiency in hundreds of the largest mills? What we have done for others we can do for you.



Interior View of Silk Mill.

WRITE TODAY for Descriptive Booklet and Paint Panel

Thomas K. Chaffee Co. Providence, R. I.

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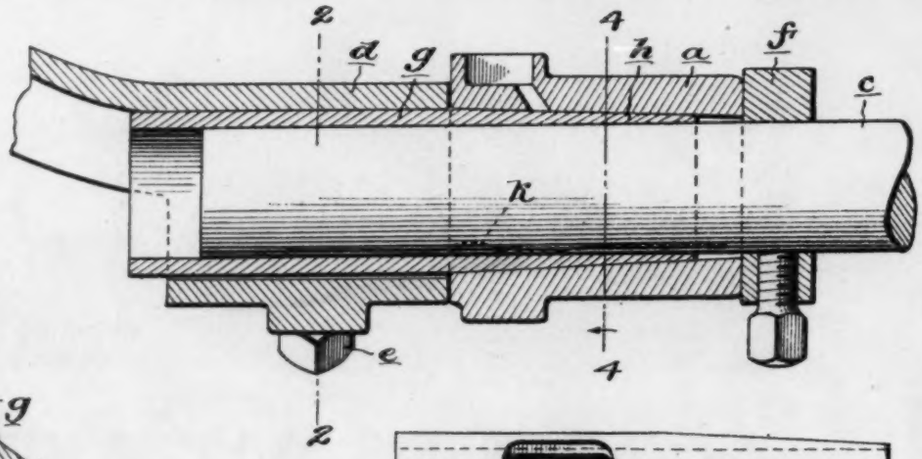
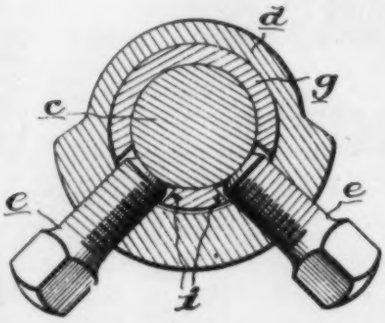
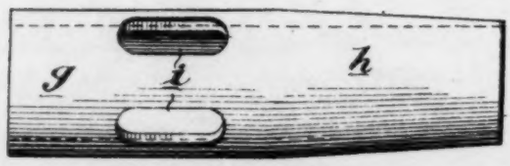
THE ROY ADJUSTABLE ROCK SHAFT BEARING WILL SAVE TIME AND MONEY

MODEL "A"







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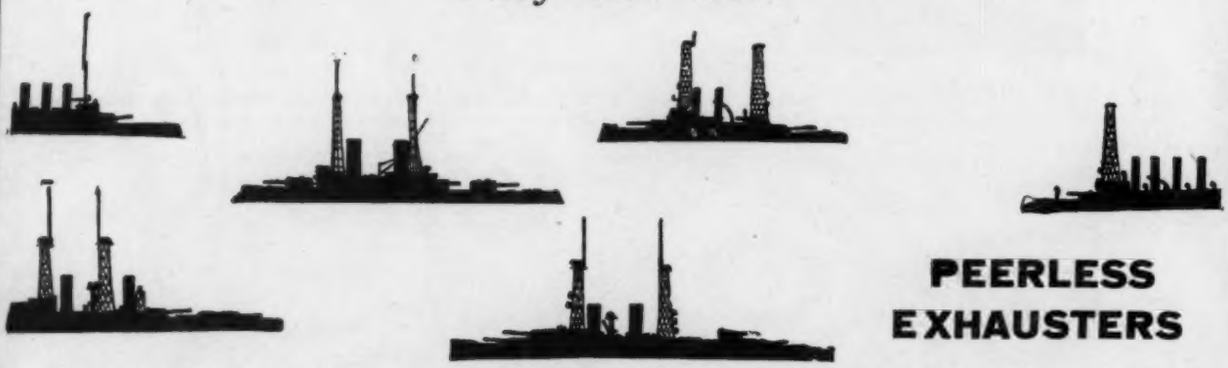

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BUILT RIGHT RUN RIGHT

Practical Problems Discussed by Cotton's Readers

We invite our readers to make use of this department for the discussion of any and all problems arising in the mill or the finishing plant. Questions, answers or letters need not conform to any particular style and will be properly edited before publishing. The editors do not hold themselves responsible for any statements of opinion or fact which may appear in this department unless so indorsed. This department is open to all. Suitable letters are paid for in cash.

Desires Balanced Twist.

EDITOR COTTON:

I have run into a proposition that is somewhat new to me, and will appreciate the aid of some of your readers therein. I would like to see an article on reverse twist yarns that will explain how I can balance the twist or make a yarn that will hang dead. Say, for example, a yarn of 40's, 3-ply reverse twist, having 25 turns in the ply. What number of turns of twist should go into the single yarns to keep this yarn from kinking?

Another example would be, say, 50's two-ply reverse twist with 30 turns in the ply. What number of turns of twist should go into the single yarns in this instance to make a balanced thread which will hang dead?

I have been unable to find anything on this subject in any books on spinning which I have been able to find, and the result of my trials is largely a question of hit-or-miss. I hope some of the writers who contribute to your various departments will go into this subject thoroughly and deal with it in all its phases. B. T. (S. C.)

Who Will Answer These?

EDITOR COTTON:

I would thank you to allow me space to ask the following questions:

1. Of what value is the term "break draft"? When, and for what is break draft used? Define break draft.

2. On hosiery yarn in building, a filling wound bobbin, which is better, to set the traverse ring rail to traverse at its fastest speed going up or going down? Why?

3. On a warp build frame, what gives the slow motion to the ring rail when the bobbin is full? Why does it take the ring rail the same time to traverse the stroke when the bobbin is full or at its shortest layer as it does when the bobbin is empty and at its longest layer?

4. Is the twist uniform throughout the build of a warp wound bobbin? If there is a difference on any number of yarn and any size bobbin, what causes this difference?

5. When has the traveler its fastest speed, when the bobbin is full or when empty?

O. K. (Mississippi.)

Lancashire Acme size is used for heavy work, where a weightener is required. It is manufactured by The Arabol Mfg. Co., 100 William Street, New York City, which stamps it as a cotton warp size of merit and efficiency. It cannot mildew, is semi-solid and can be used along with starch as usual. Textile workers are enthusiastic in endorsing its many excellent points and it is said to be unexcelled as a weightener.

Opening and Mixing.

EDITOR COTTON:

The object of mixing cotton is to secure as nearly as possible a uniform grade, or in other words, to make one lot of cotton run as nearly as possible like the preceding lot. Cotton as it comes to the mills, from different sections of the country, is widely different in its character. Some of it is cleaner than others, and some of it is slightly longer in staple than the rest—I say slightly longer because all mill men know that a very long staple cotton cannot be run successfully with a short cotton, and for that reason it is never used except where the staple is near enough of the same length to allow of its being run together.

It is almost impossible to lay down a rule in an article like this for mixing cotton that can be used in all mills, because some of the older mills, and I am sorry to say, a few of the new ones, are so handicapped for floor space, that it is impossible to mix the cotton so as to get the best results. However, I think all mills should be equipped with a bale breaker so the cotton can be more thoroughly opened. When using cotton of different grades in the mixing, it should be managed in the mixing so that no two bales of the same grade shall come in contact with each other.

The first bale should be spread over all the floor space to be used for the mixing, the second bale spread to cover the first bale, the third bale spread to cover the second bale, and so is made up from layers of each bale of cotton. When using the cotton it should be pulled away in small sections from the top to the bottom of the mixing so as to obtain a portion of each bale. The cotton should be taken from the bale in small bunches and torn up into a loose state, not in large bunches or flakes, as it does not assume its normal condition when in these large flakes. Also this is expecting the automatic feeder to tear up those large flakes and feed a regular supply of cotton to the subsequent process, which it cannot do. The result is, we get very uneven breaker laps. However, it takes a little more time and cost to get cotton thoroughly opened, but it is the means of less cost at the later processes and makes even and smooth yarn and good running work. This means success to the mill.

To rework the waste such as is made at the fly frames and spinning room it is necessary, for the best results to take all the waste and run it through the "brake" and have it carried back to the opening room and mixed in. A good rule is to put down one layer of cotton from the different bales and then spread a thin layer of waste over this and then another layer of cotton and another layer of waste. Carry this process out until you have all the waste run through.

The automatic feeder is the first machine that receives the cotton after it has been mixed. In order that the feeder may perform its best work, it should be kept clean, the

aprons kept taut and the bearings kept clean and well oiled. The hopper should be kept at least half full and should not be filled too full for the best results. If it is allowed to run down, as a careless operator will permit it to do if he is not watched, the less cotton there is in the hopper the greater the liability of the lifting apron securing an insufficient amount, thus causing a thin lap to be made, and when the hopper is filled, if filled too full, will cause it to feed too heavy and produce a heavy lap.

The breaker, intermediate and finisher pickers have for their objects the separation of the matted mass of fiber into loose flakes and the removal of the mats, dirt, sand and leaf and the producing of a lap. First the speed at which the beaters run and the blows per inch that the cotton receives is a very important point. Also the distance between the beater blades and the feed rolls for the breaker. The breaker beater should not strike the cotton over 40 blows per inch; the intermediate, not over 50 blows per inch; and finisher not over 60 blows per inch. Set the beater to the feed rolls on the breaker 3/16 of an inch; the intermediate 1/8 of an inch; and the finisher 1/16 of an inch. For a carding beater for 1 1/8 inch staple cotton, the action of the beater is one of the most important parts of the picking, for it is desired not only to clean the cotton, but to do this with as little injury to the fibers as possible. The speed of the beater must therefore be so regulated that it will not strike the cotton too often and thus injure the fibers, nor should the speed be so low that it will not strike the cotton often enough and thus not clean it sufficiently. The evenness should be looked after closely. The segments should be kept clean. The entire evener motion should be kept clean so it will work freely and prevent uneven laps. Keep on a good evener belt, and this is an endless belt.

There are several things that will cause split laps: improper air current; too much friction on the horse head; or letting the air passages become choked with waste or sand. There are several things yet that could be mentioned on this subject, but I do not wish to take up too much space at one time.

Ted. (N. C.)

Flota Mica.

Flota mica is a compounded dry lubricant that is intended to be mixed with oil or grease for use on hot bearings. It can be fed through any and all kinds of lubricators and oil or grease feed cups, it is claimed, and does not cake or harden. In action, this compound is intended to fill up the minute depressions that appear in the rubbing surfaces and form a new surface of symetrical outline. It is also particularly valuable to use as a coating on manhead or hand-hole gaskets, allowing the gaskets to be removed with the hand-hole plate without breaking or tearing. Mixed with oil or grease, it makes a useful pipe joint compound that not only allows the pipe to make up tightly, but makes it easier to take down for changes. Detailed information may be secured from the Flota Mica Sales Co., 248 Moffat Building, Detroit, Mich.

The General Chemical Company announces removal of their offices to the Morris Building, 1421 Chestnut Street, Philadelphia, Pa.

Be Watchful.

EDITOR COTTON:

An important thing to my mind is to be watchful! Take the word watchful from a business standpoint alone and it is all important. Think for a minute! If we are not watchful, we will not be successful. Success cannot be obtained without watchfulness. We cannot manage our mills unless we know what is going on, and there is only one way to know and that is by being watchful.

Take an overseer in any department of a mill and ask him what kind of a yarn he is running on a certain machine or what gears he has on this machine and he should be able to tell all about it, if he is watchful.

Watchfulness does not mean that we should see things after they happen but that we should see them (or many of them) several hours before they happen, because, if we can only see what has already happened then, we are of no more value to our employers than the help that work under us. Don't understand me to mean that we are better than the help from a moral point of view, I only mean in a business way. Any one knows when the mill gets on fire, therefore, Mr. Overseer you should be able to know what is going to happen in your department just in time to save many things from happening, that is, of course, to a certain degree.

Being an overseer of a finishing department in a mill where they run all numbers from 2's to 70's carded and combed I cannot think of any other way to be anything like successful unless I keep my eyes open and be watchful. It is always on my mind to be watchful and get good work out and no mixed yarn.

In the room of which I have charge we make possibly 25 or more changes of yarn on the machines on some days, therefore the chances are very great for getting the yarn mixed. I have made it a habit to go to each hand that has changed yarn some time after they have changed and ask them what kind of yarn they are running, carded or combed, and what number. That is not always necessary with some help, however, I believe in "safety first," so I ask them all.

It is also true that we use different colored cones for carded and combed yarns and there is always a card showing the number of yarn that each machine is running. But even then some hands will make a mistake, so I have found it very good policy to ask them what they are running. When it is considered that some hands have run a certain number yarn for weeks, or that they have changed several times lately, it is at once evident the chances are very great that they will mark tickets with the old number, therefore I also consider it good policy to see every change that the second hand makes, and to personally see that the hands know just what number they are running. It takes only a very few minutes and saves many mistakes and much mixed yarn. Try it and see.

The overseer of any finishing department cannot be successful if he is not watchful. Watchfulness is by no means success, but it is a good start on the road. If you are watchful and see things and do not correct them, you have lost the advantage of watchfulness. As I very often say, *see what you see*, get the point? Let nothing escape your eye, and should you see any thing that amounts to nothing, you have lost nothing by seeing it, but unless you are able

to see things that amount to nothing, your chances are small for seeing the things that you should see. I would like to impress on the young men in the mills of today, the importance of *seeing everything* that takes place in the rooms in which they are working. By watching very closely everything that is going on they will soon be able to do things themselves, so my advice is to be watchful.

Honest Bill (Kentucky.)

Some Card Room Pointers.

EDITOR COTTON:

Carding is an important feature of textile manufacturing. Good carding is the foundation of cloth making, as there is very little or no chance of correcting the defect after leaving this department. In doing good carding is where a carder has his troubles.

One of the first troubles of a carder is the kind of cotton or rather the class of cotton he is given to work with. This is a most important object and one that is very often given little or no attention. Cotton should be graded for all classes of work according to staple, strength and color. In most mills of twenty or thirty thousand spindles a carder has little or nothing to do with the kind of cotton he uses. One day they will give him all good, clean cotton, the next will be an off grade of cotton, rather yellow and dirty, and probably the next will be all compressed, making as a whole a mean stock to run and get good results.

As this kind of stock proceeds through the mill the trouble will be traced back to the card room, where the yarn begins to show up bad, causing the work to run bad. The superintendent will probably ask the weaver what is the trouble. The weaver will say he is getting bad work from the spinning room. The spinner will say the carder keeps him "torn up" all the time, and he can't help it. Then the carder is going to have trouble. He will tell his tale of woe and say that he couldn't make black cotton white, and weak cotton strong, etc. Then he will go to the yard man in charge of sending in the cotton to the opening room and tell him that he must have better mixings, and the yard master will say that he is giving him the best he has and that he was ordered to use all this lot before using any other. This is only one of a carder's many troubles.

Supposing this trouble to be remedied, we will proceed to find others. We find that we are making uneven work and wonder what could be the cause. Suppose we find the card drawing very uneven. We go back to the picking room and make a thorough examination of the automatic feeders and find that they are not feeding the same, one is feeding light and the other heavy. We also find that some of the driving belts are slack and slipping. We adjust the feeders and belts and proceed to the intermediate lappers. Here we weigh the laps and find them varying out of reason. This trouble adjusted, we go to the finishers and adjust all parts, tighten the belts, adjust the eveners, have the picker room in good shape, making good, even laps.

About the time we feel that our trouble is over, some of the stop motions on the drawing get out of order and the machines make singlings and uneven work. Having adjusted these and leaving them in good working condition, we still look for more trouble as the roving is still weighing uneven. We go to the slubbers and intermediates, but find these machines in good order. We then go to the speeders and find that some of the gears in the crown and draft are not the same, and what they should be.

Having got this trouble adjusted and having told our section men that they have been sleeping or careless and that this must not be the case any more, we feel that our troubles are over once more and that everything will move along for a while. But the spinner brings down a sample of cut yarn and asks us to examine and see if we are not making cut work. We go to our drawing and find that some of the weights are off the rolls or we have a lap up on some of the rolls, of course making cut work. We examine all of our roving machinery and find that some of the rolls are dry and need oil, or are dirty and have chokes in them. We have all this made right and have all the driving parts and tension examined. However, this is not all of a carder's troubles, and more than one can testify that this is true.

Carder. (North Carolina.)

The Economy of Repairs.

EDITOR COTTON:

The repair cost of a cotton mill is one of the more important items connected with the mill. When everything is considered, the actual cost of repairing a part does not at all times cover the total cost. For instance, take a small mill that has to work "nip and tuck" to keep slubber roving on a pair of slubbers. It is possible for one of these to go out of commission for a few hours and cause a drag and loss of production through all the following processes, for this reason it should be the idea to keep ready at all times duplicates of the various articles or parts of machinery to avoid any stoppage, and this will prevent stopping one job and changing a shop machine so often.

Where the department is waiting on work in the shop, then each a job should take its turn, unless some portion of the mill is behind or badly crippled, then the weak spot should be given the preference. The main idea should be to keep the last machines that turn off production "humping it" and trust the processes back of them to keep up.

The master mechanic is the "man behind the gun" in all cases and should have every reasonable facility at his command to promptly remedy all diseases that come to his shop. In addition to being a mechanic he should be, and often is, a man of more or less experience through the various departments, and foremen around the mill, when in trouble, frequently confer with him whether or not the trouble really belongs there. He is, or should be, the friend of all departments, and should allow no prejudices or ill feelings to interfere with his efforts to keep everything going in good shape.

In some cases he has to do this under crude circumstances; his shop is often placed in some poorly lighted and ventilated place, not available for anything else, when it should be in a good, light, roomy space with space for all supplies that go with his department, and this place should be accessible only to the superintendent and overseers. This department should also be the supply room with the master mechanic in full control and should be enclosed in front with a counter, over which a new part is given out only when the old part is brought in exchange, with an order from the overseer. Then if the old part can be repaired or bolts or set screws can be saved this much will avoid the scrap pile.

Each shop man should be required each evening to make a list of the number of hours worked for each department and the amount of material used. This to be charged daily to each department. All invoices for supplies should be referred to the master mechanic, so he may keep posted as to the cost of each item, and also that the goods may be counted or weighed and checked with the invoices. This will avoid all mistakes of over charge, shortage or substituted articles which can at once be repacked and returned to shipper in case the goods are unavailable for use. The invoice then may be referred to the superintendent for his approval and returned to the office.

Each workman should be assigned a portion of bench room with vise and all other necessary tools, and a certain portion of the machines should be under his care to be kept clean and available for instant use at all times.

M. M. (South Carolina.)

It may be said in general that there is a considerable call in the Asuncion, Paraguay, district for cotton goods of all kinds, but the greatest and steadiest demand is for such staples as percales, unbleached white shirtings, prints of all kinds, unfinished gray cloth, ducks, calicoes, ginghams, oxfords, drills, khakis, and muslins. There is also an important trade in cotton cashmeres, trouserings, crepe, cretonne, bombazine, and mercerized dress goods. The importers there like to have percales in bolts of 30 yards, unbleached white shirtings in bolts of 20 yards, drill in bolts of 30 to 40 yards, and muslins and other fabrics for women's garments in bolts of 40 yards. Most white goods are preferred in book fold.

American textile manufacturers long have neglected the Argentine market, but during 1915 conditions brought about by the war forced an active demand for American textiles, and, for the first time, the United States figured, although modestly, in some of the tables showing percentages of textiles furnished by the various countries. The United Kingdom and Italy led in this line, and only in the items of cotton hosiery and cotton yarn did the United States get any appreciable part of the business. The year witnessed the coming to Argentina of a considerable number of representatives of American textile manufacturers. They seemed to have been very successful in obtaining orders, but not so in getting their principals to fill them. Apparently textile manufacturers in the United States were not ready to engage in export trade with Argentina. It is contended that the requirements of the Argentine importer can not be met except by altering to a considerable extent both the manufacturing and the selling branches of American mills. On the other hand, the Argentine importer closely in touch with local conditions and tastes, is obliged to demand that goods be shipped exactly as ordered.

Northrop loom development has kept pace with the demand for looms for weaving nearly all varieties of goods that can be woven with one shuttle. The most recent addition to the list which the Draper Company has made is the Northrop turkish towel loom, which was a special feature of thir exhibition at the Boston Show. Orders covering several hundred of these looms have been filled and other orders are in process.

$5.00 Imported High Speed Indicator Outfit in Case **FREE** To You for a few Minutes of your time.

Our Service Department desires the opinions of active mill men on the quality of the work shown in the advertising pages of this issue of COTTON.

We are, therefore, going to give this indicator for the best letter by a mill executive who gives the clearest and most definite reasons why, and in what manner, any certain advertisement in this number is, in his opinion, the best.

Contestants must be mill executives, from overseers to presidents, connected with spinning, weaving, knitting, or finishing plants. The letter must be accompanied by the name, address and official position of the writer in order to be eligible.

The judges will be the Editor of COTTON and the Manager of the Service Department, whose decision will be final. This is the last time this offer will be made.

Address Contest Department of COTTON, Atlanta, Georgia.

KNITTING SECTION

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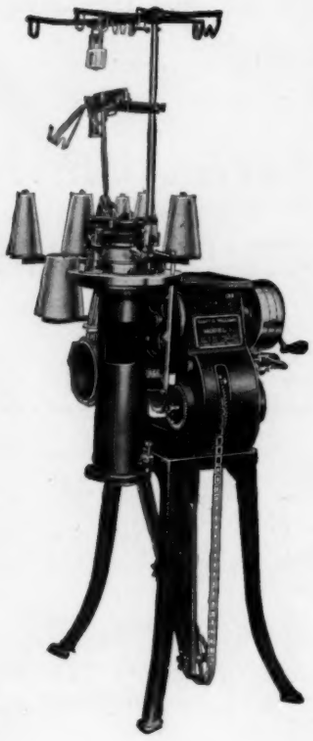

as referred to in our hosiery machines means that any model of the same diameter and gauge may be readily changed to any other model.

The discarding of serviceable machinery in order to keep up with market changes need not be feared by purchasers of our UNIVERSAL machines.

Write for samples and further information

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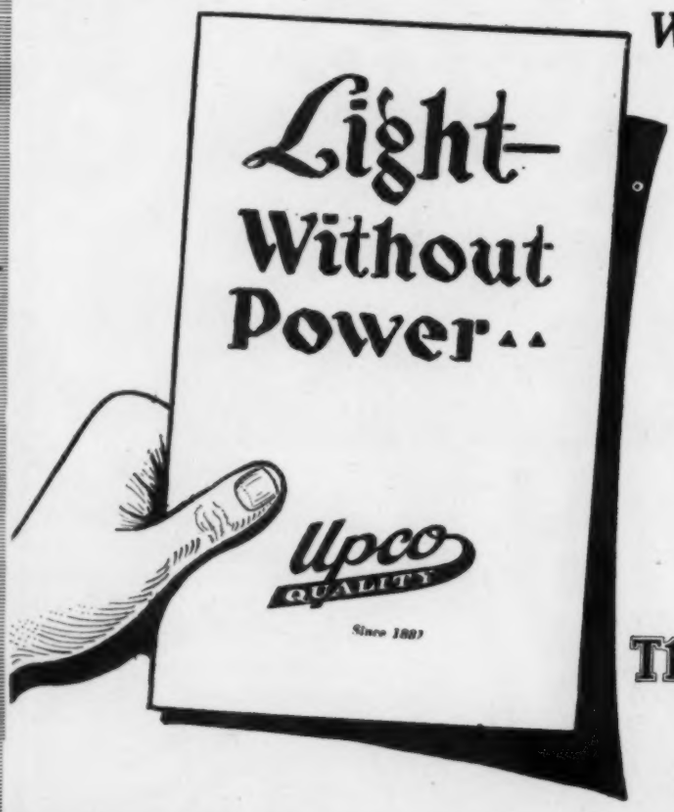

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The Ullman-Philpott Co.

Industrial Paint and Varnish Laboratories

Cleveland, Ohio

Calculations for Knitted Fabrics

BY WILLIAM DAVIS, M. A.

The average knit goods manufacturer should be able to make a much more extensive use of the yarns at his disposal by the devices of folding or using them two or more ply to give different effects in the texture and handle of the goods. For hosiery as well as underwear it is found that the operation of twisting yarns together does not give very desirable effects in handle, the goods usually turning out rather hard to the touch with consequent discomfort in wear. It is now usual to give as little twist as possible to knitting yarns, even in the single, and large quantities of goods are made with two slack twisted yarns laid together on the knitting machine, or a better plan is to run them together on the twisting frame or winding machine when a slight twist is effected by the simple operation of drawing the yarn off again from the cops or bobbins. It is in this way that certain effects were so well produced in the hosiery formerly imported.

If the manufacturer has to secure the maximum of result from using his yarns in the manner indicated, he requires to have a clear idea of the great capacity which the possession of a comparatively few single yarns will give him in the direction of producing others which will be folded but which will produce every shade of variation in size and weight. The sizes in stock are too often taken at random and the effects sought in a haphazard manner, thus many of the possibilities of such yarn combinations are never realized. If the most has to be made of this system it is advisable that the principle of permutations should be employed, which will give with definiteness the number of combinations of the yarn sizes in stock which are possible by placing the threads together two at a time, and also three at a time.

To demonstrate accurately the exact scope afforded by the manufacturer in proceeding on such lines a set of values are worked out herewith to two decimal places, a range of yarn sizes is given, (the basis of the system is at present immaterial) graded from 5's count to 60's count, the steps taking place in 5's, thus 10's, 15's, 20's, 25's, 30's, 35's, 40's, 45's, 50's, 55's, and 60's. In the first instance these yarn numbers are placed together in pairs and the resultant size for each calculated in the equivalent singles in the second case, the numbers are taken together three at a time and the resultant equivalent single yarn likewise calculated. The numbers are obtained in the twofold thread by taking the two counts and multiplying them together and dividing by the sum as detailed in a former paper of this series. Thus in the first example of 10's with 15 we have:

$$\frac{10 \times 15}{10 + 15} = \frac{150}{25} = 6\text{'s single count.}$$

The following tables are compiled in this way.

TABLE I.

COUNT OF SINGLES.	RESULTANT.
10's with 10's =	5's single.
10's with 15's =	6's single.
10's with 20's =	6.66's single.
10's with 25's =	7.14's single
10's with 30's =	7.50's single.
10's with 35's =	7.77's single.
10's with 40's =	8.00's single.
10's with 45's =	8.18's single.
10's with 50's =	8.33's single.
10's with 55's =	8.46's single.
10's with 60's =	8.57's single.
15's with 15's =	7.50's single.
15's with 20's =	8.57's single.
15's with 25's =	9.42's single.
15's with 30's =	10.00's single.
15's with 35's =	10.50's single.
15's with 40's =	10.90's singlee.
15's with 45's =	11.25's single.
15's with 50's =	11.54's single.
15's with 55's =	11.78's single.
15's with 60's =	12.00's single.
20's with 20's =	10's single.
20's with 25's =	11.11's single.
20's with 30's =	12.00's single.
20's with 35's =	12.73's single.
20's with 40's =	13.33's single.
20's with 45's =	13.85's single.
20's with 50's =	14.28's single.
20's with 55's =	14.66's single.
20's with 60's =	15.00's single.
25's with 25's =	12.50's single.
25's with 30's =	13.63's single.
25's with 35's =	14.58's single.
25's with 40's =	15.38's single.
25's with 45's =	16.07's single.
25's with 50's =	16.66's single.
25's with 55's =	17.02's single.
25's with 60's =	17.65's single.
30's with 30's =	15.00's single.
30's with 35's =	16.15's single.
30's with 40's =	17.14's single.
30's with 45's =	18.00's single.
30's with 50's =	18.75's single.
30's with 55's =	19.41's single.
30's with 60's =	20.00's single.
35's with 35's =	17.50's single.
35's with 40's =	18.66's single.
35's with 45's =	19.69's single.
35's with 50's =	20.59's single.
35's with 55's =	21.39's single.
35's with 60's =	22.10's single.
40's with 40's =	20.00's single.
40's with 45's =	21.18's single.
40's with 50's =	22.22's single.
40's with 55's =	23.68's single.
40's with 60's =	24.00's single.
45's with 45's =	22.50's single.
45's with 50's =	23.68's single.
45's with 55's =	24.75's single.
45's with 60's =	25.71's single.
50 with 50 =	25.00 single.
50 with 60 =	27.27 single.
60 with 60 =	30.00 single.

This table will give some idea of the combinations possible, taking the given counts, two at a time and by proceeding in the way indicated, it is certain that combinations which might be omitted in a system of guessing are placed clearly before us. By referring to a table constructed on these lines it is possible for the knit goods manufacturer to substitute two yarns from his stock which will exactly meet the case in regard to equivalent size and weight. The table gives many counts together, which vary greatly in diameter and which might not be possible if the threads had to be twisted together. In folding 10's with 60's, for example, with more than a few turns per inch, the question of take-up would assert itself, that is, the thick strong thread would tend to remain comparatively straight in the process and the thin thread would require to perform the most of the bending. This would bring modifications in the actual count of the thread as calculated, for the extra length of the thin thread would require to be taken account of both in calculating the size and the price per pound of the resultant count.

As mentioned, however, the knit goods manufacturer can generally use such yarns together with impunity, in fact, it is the rule that they are so used in preference to twisting them, as the correct handle is thereby much better maintained. To illustrate the scope of the table as given, let us take the case of the number 15's yarn, which is being used for a fabric. Examination of the columns show that there are a variety of ways in which one may obtain this thread if by any chance he is unable to obtain sufficient of the single thread, and he will be certain that the conditions of size or weight of the garments will remain approximately the same. In the first place he may use two threads of 30's, or 3 threads of 45's, and in the columns it is seen that the count is also given by using 20's with 60's. He may also get results near enough for all practical purposes by using 20's with 55's, 25's with 35's, or 25's with 40's.

If the count required is 10's, he may use two threads of 20's, 3 threads of 30's, 4 threads of 40's, 5 threads of 50's, or 6 threads of 60's. In uneven sizes he may select 15's with 30's, while, 15's with 25's or 15's with 35's might prove sufficiently near in some cases.

For 20's yarn could be used two threads of 40's, or 3 threads of 60's; 30's with 60's, 30's with 55's, or 35's with 50's might prove sufficiently near.

Similarly the table can be referred to for any other counts required and several combinations secured which will prove very useful. It has also a wide potential application in the case of plated goods where a fabric is often strengthened by the addition of a small size of thread plated onto the back of the fabric. Also it is often required to cheapen fabrics by plating the high priced yarn with a less expensive yarn on the back of the cloth. The customer often asks for an article exactly the same weight and texture as the present one, but with a facing of silk yarn or some other material and, in all such problems a table such as this may be of immense service by giving at a glance the possibilities when such alterations in the texture are contemplated.

For example if the contents of the present garment is in 18's yarn, but it is required to make it into a plated fabric by a thin yarn placed on the back, but with no alteration in weight, the same weight would be given by 30's yarn on face and 45's on the back, or 25's with 60's, 30's or 35's with 40's face yarn might also be sufficiently near. Of course all these numbers are in one system only and if the threads are selected from different classes of yarns such as cotton worsted or woolen, they would require to be all brought into the same denomination before operating with the table. It ought to be pointed out that the table gives the best results when the yarns concerned are all in the same denomination, for when different types of yarn are employed, some modifications have to be introduced at the dictates of experience, as the matters of yarn structure and the quantity of surface projecting material and class of spinning, all require to be taken into account when arriving at the final result.

But the results of such combinations may serve as the basis of interesting research work by the manufacturer. For the same weight of goods he is able to use a variety of single yarns laid together and so can obtain garments which will have different character of finish and handle, and it enormously increases the range of textures which he is able to show. Many manufacturers are not inclined to extend their range of goods as they say it entails greater expense and trouble of working. This is all right as long as there are unlimited quantities of the plain "Bread and Cheese" garments, but with the lapse of time it often happens that the firm is unable to secure sufficient orders to keep their machines running by such means, and they are obliged to coax the trade by offering a wider range of textures, a little enterprise in this direction is often sufficient to grease the wheels of commerce and set things moving merrily once more.

The fact is that the matter is not so complicated as it would appear at first sight for it can be done without in any way increasing the stock of yarns which are invariably the equipment of every knit goods factory. A wide range still can be secured when the yarns are used three at once and an example of such a range of qualities is given in the list herewith. The same numbers or counts of yarn are used as was the case with the two-fold threads, namely, counts from 10's to 60's, but in this case we shall take the numbers in steps of 10's. Thus the range is 10's, 20's, 30's, 40's, 50's and 60's, and it is required to ascertain the possible combinations of yarn sizes and qualities which it is possible to secure by running these together three at a time either by giving them a slight twist on the doubling machine, or simply running them together on the winding frame. To calculate the resultant counts the most convenient way is to secure the counts of two of the threads from our table 1 and with this perform the usual calculation with the third yarn of the group.

TABLE II.

SINGLE COUNTS TAKEN THREE TOGETHER.	RESULTANT.
10's with 20's and 30's =	5.41's
10's with 20's and 40's =	5.66's
10's with 20's and 50's =	5.83's
10's with 20's and 60's =	6.00's
10's with 30's and 40's =	6.31's
10's with 30's and 50's =	6.52's
10's with 30's and 60's =	6.66's
10's with 40's and 50's =	6.90's
10's with 40's and 60's =	7.06's
10's with 50's and 60's =	7.29's
20's with 30's and 40's =	9.23's

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Beam Dyeing Machine

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Owners and Manufacturers

20's with 30's and 50's = ... 9.68's
20's with 30's and 60's = ...10.00's
20's with 40's and 50's = ...10.50's
20's with 50's and 60's = ...11.54's
30's with 40's and 50's = ...12.74's
30's with 40's and 60's = ...13.36's
30's with 50's and 60's = ...14.25's
40's with 50's and 60's = ...16.20's
2/10's with 20's = ... 4.00's
2/10's with 30's = ... 4.28's
2/10's with 40's = ... 4.44's
2/10's with 50's = ... 4.54's
2/10's with 60's = ... 4.61's
2/20's with 10's = ... 5.00's
2/20's with 30's = ... 7.50's
2/20's with 40's = ... 8.00's
2/20's with 50's = ... 8.33's
2/20's with 60's = ... 8.57's
2/30's with 10's = ... 6.00's
2/30's with 20's = ... 8.57's
2/30's with 40's = ...10.90's
2/30's with 50's = ...11.54's
2/30's with 60's = ...12.00's
2/40's with 10's = ... 6.66's
2/40's with 20's = ...10.00's
2/40's with 30's = ...12.00's
2/40's with 50's = ...14.28's
2/40's with 60's = ...15.00's
2/50's with 10's = ... 7.14's
2/50's with 20's = ...11.11's
2/50's with 30's = ...13.63's
2/50's with 40's = ...15'38's
2/50's with 60's = ...17.65's

Taking each of the stock yarns we can run three together, thus:

3/10's = ... 3.33's single.
3/20's = ... 6.66's single.
3/30's = ...10.00's single.
3/40's = ...13.33's single.
3/50's = ...16.66's single.
3/60's = ...20.00's single.

This table is more generally useful in the case of the heavier fabrics of the sweater class as the majority of the yarn sizes are comparatively coarse and in such cases the fractions of a yarn number are often of importance in regard to the ultimate weight. This table is of use for reference in the case of the thick fabrics produced on the purl stitch machine where thick worsteds are the order of the day, the yarns being loosely twined together often as much as 6-fold, and they can often get the quality finer by using a number of yarns spun from finer wool plied, so that the whole fabric attains the same excellence of handle. If the same thickness of yarn were obtained in a single or even a double thread, the fabrics from which it would be spun would in all likelihood be too coarse and thick in the hair to be suitable for a high class article.

Consideration of this table will make it clear that it can be used in a variety of ways on the lines of that given for two-fold counts.

THE PERMUTIT PRINCIPLE.

The tables have been given to enable the manufacturer of knit goods to make the utmost use of his resources and the principle can be used in other directions. We have known it to be of immense service in the matter of color combinations, as most factories have a line of goods where color plays an important part in their chances of effecting a ready sale and the question of producing new and novel color effects is often one of great difficulty. Some years ago we examined the stock of colors of one firm who found it difficult to produce something different to the shades of the previous season and on enquiry it was seen that the color combinations were effected in a very haphazard manner, the overseer just doing the best he could with the samples in hand.

There was a demand for colored folded yarns, two or more ply, and the object was to devise new combinations for these. The system followed in making a new range was that exemplified in Table 1 and indeed it may be replaced to suit a range of color combinations by substituting the colors for the yarn numbers 10's to 60's, in all eleven colors, and by placing them together in permutation as shown, the full range possible is sure to be forthcoming. By proceeding in this way one has the satisfaction of knowing that no possible combination of the colors has been omitted and quite accidentally one is sure to strike many combinations which would never have been discovered by the usual methods of combining the colors according to fancy. A further range of colors can be devised by using the shades three together as given in the second table.

The Knit Goods Market.

Selling hosiery in the primary market continues to be a matter of less detail and exertion than finding it to sell. The demand continues strong for almost every line and gradually the mill price is climbing.

There is a market for about everything wearable in hosiery, as instanced by the promptness with which a lot of 2,300 dozens of a mongrel type was picked up here a week or two ago. A New York concern had that quantity, minus the toeing, and wanted 40 cents a dozen net. They were of low-price yarn and were lacking in evidence of workmanship; yet they were snapped up by the first mill to whom they were offered, and the buyer felt that he had gotten a real bargain.

A mill which has been getting 62½ cents a dozen for two-pound 84 needle half hose made from waste yarn, last week announced an advance of five cents, and other mills have followed. The manufacturer who started this upward movement sells 2 off 10 days F. O. B. mill, and makes no freight allowance.

Mills which, in an eagerness to book business, named inadequate prices, have suffered in more ways than one. It would have been as easy to sell to capacity of help at a better profit. A manufacturers of misses' two-pound ribbed, who, early in the season, went on the market at 77½ cents a dozen, was laughed at by some of his competitors, who predicted that jobbers would not pay the price. They did, however, and the mill could have sold up for next spring delivery had it been desired to do so, and now is getting five cents better. Doubtless there are many manufacturers who now can appreciate the stand taken by the mill in question—a Southern establishment.

In the Reading, Pa., hosiery district, it develops, several mills are committed for deliveries at prices considerably under those readily obtainable today, and are said

THIS BY ITSELF MAKES ANY OLD PRIVY FLY-PROOF AND SANITARY

No need for screens or "vaulting in" to make flyproof—No need for running water, plumbing, high priced fixtures or labor to install the

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Extra deep upright receptacle makes it superior to shallow can or conical containers with slanting sides, and prevents contents from splashing out when removed for cleaning.

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GIVES ALL THE PRIVACY OF THE SEWERED CLOSET for only $2.50 per closet in quantities.

Don't be deprived of an adequate toilet system,—don't wait for more time and more money to "invest" in high sounding, complicated, expensive systems and devices to improve your sanitary conditions.

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the efficient, the practical, the best by test, most economical device for the purpose on the market at anywhere near its price or ask for detailed information and answers to special questions NOW.

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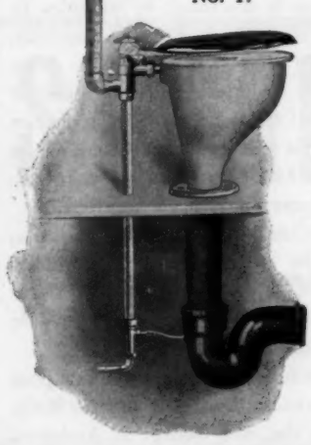

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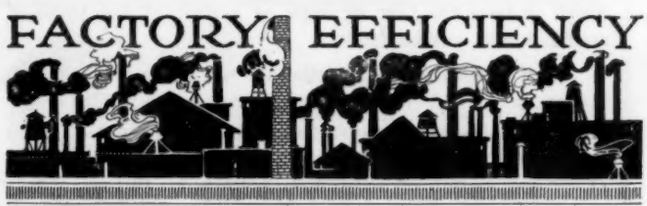

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Kaustine WATERLESS CLOSETS

solve your problem of sanitary sewerage disposal. No matter what the size of your plant—where located—or even if you have supposedly good water and sewerage connections—we can show you how to secure even better sanitary conditions and save money at the same time with the Kaustine System.

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Chemical Sterilization—The Kaustine Chemical deposited in the "Armco" iron tank is a powerful resolvent and germicide. It disintegrates all sewage matter, destroys all germs, and reduces the sewage to a semi-liquid chemical state, harmless and odorless, that can easily be removed.

Aeration—The down draft system shown in diagram insures a continuous flow of fresh air through the system and out the ventilator. This prevents odors from entering the toilet room, removes moisture by evaporation and also gives a constant supply of oxygen, effectually ending other germ life at this point.

Aeration diagram showing path of air currents down through the seat (A) to ventilating duct (B).

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to be operating at a loss, figuring on present prices of cotton yarns. The manager of one such mill, making ladies' artificial silk boot hosiery, says he is taking his loss now, but that in the future he will enforce acceptance of delivery as rigidly as he now is adhering to the Golden Rule, in shipping merchandise out at no profit.

There probably is not a mill in Reading that is not loaded to the roof with business, and some of them are getting prices bordering on the fancy. This, however, applies only when the buyer cannot find the goods elsewhere and must have them. A line of cotton half hose that in May was quoted at a dollar is a ready seller at $1.05 a dozen, and, the manufacturers announce, will go to $1.07½ on September 1st.

In some instances price stiffening has proved more fruitful in promoting buying than an advertisement. A mill which could not find a market for a line of cotton hosiery at $1.15 a dozen laid his trouble before a New York agent, at whose suggestion the price was moved up 10 cents, after due announcement. The result was a prompt inquiry from a number of buyers and an unexpected demand was created at the higher quotation. This may have been an exceptional case, but the fact remains that most manufacturers who have held out a proper price have gotten it and are not begging for business.

In some lines, particularly artificial silk goods, there is some uneasiness among manufacturers because of the affected indifference of buyers. It is true there remains considerable buying to be done for spring, but this should not occasion any alarm, for it is freely predicted that there is going to be a shortage, and there is nothing in sight on which to base the fear or hope of a drop in the price of artificial silk yarn.

From present indications there is not going to be enough infants' socks and children's hosiery to go around, by a considerable margin. Manufacturers of these lines, it is a safe assertion, are sold beyond production and are banking on the installation of additional equipment. But, according to machine builders, who say that there have been heavy purchases of machinery for making this class of goods, much of the anticipated machinery cannot be delivered. Machinists are as scarce as white knitters in the South, and steel for machine building is not always available.

An Eastern manufacturer was in Philadelphia some days ago in search of children's hosiery, three pounds on size 9. He previously had visited a number of mills, but said he could not buy a case. The best that he could do was to arrange with a machine house for the use of a machine on exhibition, by which he is to get 400 dozens, all of the same size.

Possibility of a lessened demand for artificial silk goods for export may have something to do with the tardiness of some buyers in covering for their spring requirements. England and Canada have been buying heavily of American made knitting machines many of which are known to have gone to France. It is known, through consular and trade sources, that British mills are making large quantities of hosiery not alone for supplying that which formerly was supplied by Germany, but for feeling out the export trade, in the United States and elsewhere.

The Wildman Manufacturing Company, Norristown, Pa., two weeks ago received an inquiry from Canada involving an unusually large purchase. One of the Philadelphia builders of knitting machines is having an output of less than 50 per cent of factory capacity, all due to the inability to hire mechanics. Another Philadelphia concern is behind in deliveries and has had plans prepared for an addition to the factory.

There has been no relief from the needle stress and none is in immediate prospect. It is stated that good progress has been made in procuring capital for the company headed by C. Walker Jones, but nothing definite is given out as to when the making of needles by this company on a large scale will begin.

A Philadelphia sweater manufacturer has evolved a method for repairing needles used in that division of the knitting trade, and has ascertained that by carefully watching the needles and making repairs before the damage is really serious it will be possible for him to avert the consequences of the famine. Sweater manufacturers are being canvassed for the number of damaged needles in their mills and urged to send them to the repair shop. It is estimated by 20 sweater manufacturers in Philadelphia that, making no allowance for rebuilt needles, they would require 300 a day for their 20 mills for replacement.

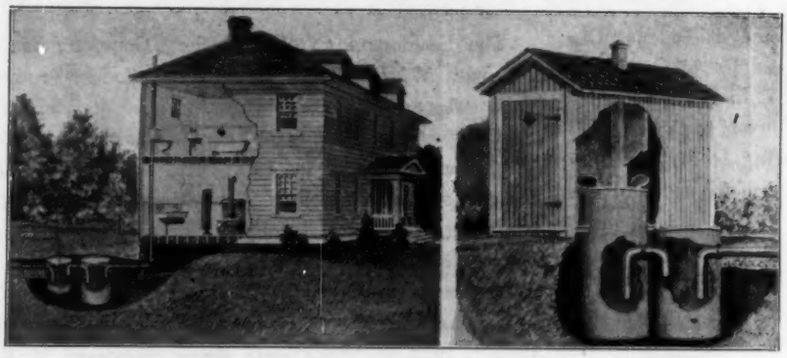
A canvass made by the National Association of Hosiery and Underwear Manufacturers disclosed that of 117 mills reporting, 45 have machinery idle because of the needle shortage. Some few plants are operating only 75 per cent of the machines from this cause. Most of the manufacturers who have kept all of their machinery moving report that they are near the end of the string and that unless supplies are soon received they will be compelled to partly close down.

There is a growing belief that it is only a question of a few years when Japan will be a competitor in the hosiery and underwear markets of the United States for the domestic trade. Several days ago there came a request from the New York representative of Japanese interests for copies of the scale of standard sizes for underwear. An American consul in Japan, replying to an inquiry from Philadelphia, states that the exports of Japanese hosiery to the Pacific slope, Hawaii and the Philippines are very large and increasing. He says the manufacture of hosiery for export is a large and growing industry, and adds: "The consul at Kobe can give you some information that will interest, if not startle, manufacturers of the United States as to the volume of business that they are losing."

Hosiery made in Japan, as is disclosed by samples in possession of a mill agent, is not adapted to American needs, being skimped and illy shaped. Underwear from the Orient measures up pretty well to American ideas of inexpensive stuff. However, all the knit goods that Japan might send to the United States this year would not make a dent in the market. It is the future rather than the present over which manufacturers here seem anxious.

The Metal Hosiery Form Company, of St. Louis, Mo., will hereafter manufacture the metal forms in Philadelphia, having procured quarters on Catharine street. These are among the metal forms objected to by union boarders here, unless they be made by union labor.

Among Southern hosiery manufacturers in Philadelphia in the last few days were Garnett Andrews, of the Richmond Hosiery Mills, Rossville, Ga., and George T. Andrews, of the Enfield (N. C.) Hosiery Mills Company.



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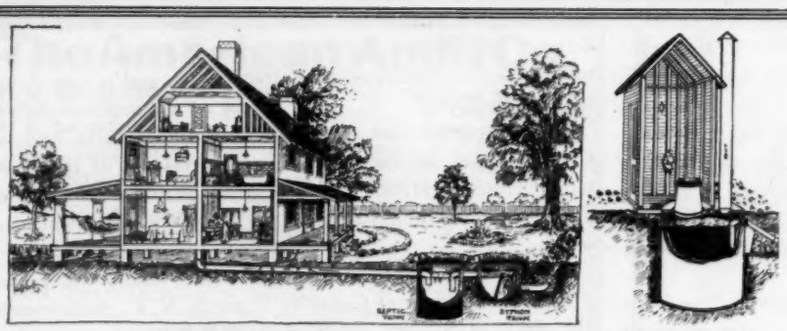

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Electrical Merchandise

of every description.

BOSTON

Among the Knitting Mills.

A large knitting mill is being erected at Galena, Ill., near the plant of the Interstate Light and Power Company.

William H. Spanswick, Fulton, N. Y., is said to be giving up the manufacture of underwear owing to the scarcity of material and the difficulty of securing labor. The department for knit wash cloths will be continued and enlarged.

Fire from some unknown origin did damage to the amount of $35,000 on Aug. 6th, when the two-story hosiery mill owned by Harry Smalley, at the rear of Nos. 111-113 East Rittenhouse street, Philadelphia, was destroyed.

The Keller Knitting Company, Cleveland, O., has rearranged its factory and added a number of machines. The plant has been operating at capacity for the last year.

P. G. Bowman, Sumter, S. C., contemplates building a knitting mill, and wants information as to the required machinery.

J. W. Watts and A. E. Watts, Taylorsville, N. C., will establish a hosiery knitting mill. They have purchased the machinery.

The new mill for the Nick-a-Jack Hosiery Mills is now completed and ready for the machinery. The main building is 120x70 feet, two stories. It will replace the present plant. To the latter's equipment of machinery, it is expected to add 100 knitting machines. Fiber-plated and mercerized half-hose is the Nick-a-Jack product.

Operations have been started in the new plant of the Star Hosiery Mills, Spartanburg, S. C. The main building is 120x50 feet. When in full operation it will have a daily capacity of 1,000 dozen pairs of hosiery. The total equipment to be operated consists of 120 knitting machines, 25 loopers, and 12 ribbers.

The Oakbrook Hosiery Mills at Oakbrook, Pa., are being enlarged by the erection of an annex, which will include a new dye house. Isaac C. Eberly is the owner.

The O. K. Knitting Mills, New Orleans, La., will establish a plant at Mobile and have leased a four-story building for the enterprise.

Owing to the necessity for the enlargement of its business, the Rensselaer Knitting Company may move its plant from Troy, N. Y. The decision is said to depend on whether or not the company secures a large export order for which it is now negotiating and which is said to amount to $500,000.

The Hartford Hosiery Mills, Nashville, Tenn., has purchased a building and will install an equipment for knitting half and full hosiery, this machinery having been ordered.

E. Sutro & Son Co., hosiery manufacturers, Philadelphia, Pa., have set aside the third floor of a recently built addition to the mill, East Thompson and Clearfield streets, as a rest and recreation room for the employees.

E. L. Shuford, of Hickory, N. C., will build a knitting mill, and has purchased the equipment of machinery.

Ground has been broken for the new Taubel Hosiery Mill on the large plot 100 by 370 feet recently purchased in Pleasantville, N. J., by William Taubel, Inc., of Riverside, at Ingersoll avenue and Main street. The building is to be of brick, one story, with cement foundation, 50 feet front by 240 feet deep and 13 feet high.

The Garterless Hosiery Company, Wilmington, Del., has been incorporated with a capital stock of $150,000 to manufacture hosiery.

The Henderson (N. C.) Hosiery Company has organized with W. B. Waddill, president; J. H. Brodie, vice-president, and William A. Hunt, secretary-treasurer. Contract for a 72 x 35-foot mill construction building, costing $3,000, has been awarded to W. H. Fogleman, and machinery equipment will include 50 knitting machines, with electric power drive for a daily capacity of 350 dozen pairs of hose.

An early Sunday morning fire did considerable damage to manufactured stock and machinery in the Meredith Hosiery Mill on North Long street, Salisbury, N. C. The blaze was discovered just before 3 o'clock and at that time the rear of the building was in flames. The stock and machinery carried several thousand dollars of insurance, which probably covered the loss. The fire is of unknown origin, but appears to have been the work of an incendiary.

The Bettie Francis Cotton Mills will be doubled in capacity and the underwear department of the Russell Manufacturing Company, Alexander City, Ala., greatly enlarged. Benjamin Russell, president of both concerns, states that the changes in the mills will give employment to several hundred additional people. Mr. Russell stated that the machinery for doubling the capacity of the Bettie Francis Mills has been purchased and that the material for an extension is being assembled.

The Philadelphia Knitting Mills Company has changed its name to Philadelphia Sweater Mills.

On account of business expansion the Klock Hosiery Company has moved its mill to 2427 Mascher street, Philadelphia, Pa. It was at Fifth street and Lehigh avenue. The mill turns out mercerized goods for women and is now doing its own finishing.

It is reported that a new knitting mill is to be built at Oneida, Tenn., by Garnett Andrews, president of the Richmond Hosiery Mills, Rossville, Ga. Asbury Wright, of Knoxville, and Polk Tarwater, of Rockwood, are also interested.

S. J. Erwin and others have incorporated the Kilson Hosiery Company, at Connelly Springs, N. C., with a capital stock of $75,000, of which $10,500 has been paid in. They will take over the Connelly Springs Knitting Mill.

Personal reminiscences of James Mapes Dodge, is the title of a 24-page booklet by Charles Piez, President of the Link Belt Company, Chicago, which was recently sent out by the publicity department of the Link Belt Company. It is beautifully gotten up and well illustrated. Another booklet recently issued by the Link Belt Co., is a revised price-list effective July 15, 1916, and supersedes all lists in catalogue 110 covering the complete line of link belt manufactures. Either or both of these books may be had on request.

The Transmission Ball Bearing Co., 32 Wells St., Buffalo, N. Y., have found it necessary to build and equip a factory having a capacity of three or four times their present output. They are now in the market for machinery and equipment to handle a complete line of shafting, bearings and loose pulley bushings, as well as machinery to manufacture their Universal elevating trucks.

Mercerized Yarns

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Attention, Mr. Knitting Mill Man!

We sell needles for your German Loopers at $2.00 per hundred. Satisfaction guaranteed.
Samples sent on request.

PERFECTION NEEDLE CO., 305 Elm St., Durham, N. C.

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FPCO

FRANKLIN PROCESS COMPANY
291 Promenade Street, PROVIDENCE E. R.
Machinery for dyeing yarns wound on parallel tubes.
Installations in Riverside and Dan River, Gibson Mfg. Co., Patterson Mills and others.

Six Sizes

¼"—⅜"—½"
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One Tool

Oster Bulldog
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Scientific Methods in the Underwear Mill.

In a recent issue I pointed out some of the difficulties in the knitting mill because of too many styles. During the past week the writer met an old-time manufacturer, and it was not long before he mentioned what evidently was one of his greatest difficulties. "The whole thing is so cut up," he said, "not much of any style to be made." The whole thing is so cutup, and, no doubt, he will go on and cut it up some more.

The trouble in one way seems to be in the fact that goods are peddled, as it were, rather than being sold; and more attention is being paid to getting out garments to sell at a price than to getting out good merchandise and selling it for a price; or, as it is often heard, they are buying prices and not good merchandise.

Any mill should have at its head a man who is a merchant; that is, a man who knows how to market goods as well as knowing how to manufacture them after the proper manner. Any mill having to depend upon some selling agency to market its product and fix on what kind of goods are to be made, and at what price, certainly is not in an enviable position. This is too much like working for someone else at a bench. Still it is true that a great many mills are doing business after this manner. The selling agency dictates as to what kind of goods are to be made and at what price. Here we might enter the suggestion that there is too much handling and not enough common sense.

We have stated that what we wish to do is present some common sense in connection with the subject under consideration; and common sense should tell us that the more any product is handled the more it has increased in cost, but not in value. The number of times a thing is handled has little to do with its value, but it certainly has a lot to do with its cost.

A garment may be made in one city, the selling agent sells it to a jobber in another city, and the jobber in turn may send a salesman or a peddler, as the case may be, to sell the goods to a dry goods store in the same city or town where the mill is located; and so the goods have been shipped to the city of the jobber, placed in his storehouse, and after a while these same goods are reshipped to the town where they were manufactured; thus being handled and rehandled, increasing their cost, but not their value.

We picture the condition to our mind thus: a buyer goes on the road to buy cotton, another traveling man goes on the road to sell some yarn for the cotton spinning mill, another man goes on the road who is sent out by some selling agency who sells yarn, and he goes to the knitting mill. Again some traveling man is sent on the road who represents some selling agency for underwear. He calls on the jobbers of the town; he may sit in the same seat on the train with another man who may represent the jobber on whom he has just called in an effort to sell goods for the mill. The selling house man handles a certain mill's goods, and the other man represents the jobber selling the same mill's goods. Both get off the train at the same town. One man goes to the jobber to sell him this certain mill product, and the other man goes to the retail stores to sell them the same thing. These men are not only traveling on the same trains, but they are coming and going up and down the country all the time, and the goods that they are selling are being juggled back and forth up and down the country in the same way. Someone might suggest that this makes the hotel business good.

This reminds me of the story, which is a true one, that a superintendent of a steel mill told regarding his own experience. On making his rounds one morning he asked one of his workingmen, "Mike, what are you doing?" Mike answered, "nothing," being caught, of course, loafing. The superintendent went a little further on and saw Pat loafing too, and he asked, "Pat, what are you doing?" Pat says, "I'm helping Mike." Pat did not know that Mike had told the superintendent that he was doing nothing. Exactly the same thing obtains when we come to apply common sense to our subject. These traveling men may be working awfully hard as far as that goes, but really doing nothing after all. It is obvious, of course, that they are not to blame. Mike and Pat were helping one another doing nothing—taking it easy. The traveling men who are working hard going up and down the country doing nothing, but working hard at it.

The answer is, no traveling men should cross one another's paths selling goods to be shipped up and down, back and forth, but the goods when they leave the mill should go to their final destination where they are to be used by the consumers. We can easily see that this would be a great saving on car wheels and steel rails, as well as retail prices.

We can readily see why the production in the knitting mills is so cut up—too much peddling. Let the mill have its own selling force to be sent out from the mill office and subject to the mill and not to some agency who is more interested in profits for self than for the mill. Then let the mill decide what it can make to good advantage, get out such styles under a proficient manufacturing head or management, have these goods placed on the market direct to the retail stores. Let these few styles of whatever kind they may be, be produced under efficient manufacturing management; and when the salesman goes on the road, let him know what samples he has to sell. Don't let him telegraph back to the mill—"I can sell some sweaters"—when he knows that the mill makes underwear and not sweaters. If someone shows him a garment of some other manufacture, and the store keeper says, "Now, if you had something like this I could give you an order." Don't let the salesman telegraph home to the mill and say, "I can get an order for some ladies' summer vests," when he knows the mill he represents does not have this equipment for any such style garment.

Let the policy for the salesman be this: "where do you buy these goods?" The storekeeper would say, from such and such a mill. "Well, why don't you continue to buy these goods from this mill?" Then the store keeper would doubtless reply, "I placed an order with this mill last year, and when it came time for delivery I made up my mind that I had ordered more than I needed, so I cancelled a lot. We had some correspondence about it, and now I'd rather buy from someone else."

The salesman should then say: "Well, I am sorry, but as stated we make only men's union suits in the winter weights, and, of course, I can't sell you something that we don't make, can't make, and don't intend to make. You had better order your goods from this mill, who make a specialty of this kind of garment. If we should make you the garment that you ask for, we would have to buy some-

By S. M. Peterson in the Canadian Textile Journal.

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It saves time, labor, machines and cloth.

YOU ONLY NEED ONE MACHINE where before it required two, and you get an extra strip from every bolt of cloth.

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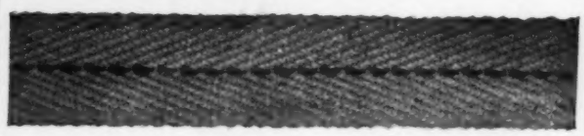

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SOAPALITE

The Electric Smelting & Aluminum Co.

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different kind of machinery than we now have. If we want to increase our production, we would rather push our sales on just what we are now making.

"Besides buying different kinds of machinery from what we now have, we would also have to buy altogether different kinds of yarn from what we now use. Our knitter is not so familiar with this kind of knitting, our dye house is not equipped for this kind of work, our help, from beginning to end, would have to be taught to do this work. We would have to buy altogether different kinds of trimmings from those we now have, different boxes and labels, and even different size cases would have to be purchased and kept on hand. In all, can't you see that the product that you would get from us would not be such a finished product by far as that you are now getting from this mill, who has never made anything but this one thing year in and year out?

"Besides going to all this expense and trouble, we would have to charge more money than you are now paying; for it stands to reason that we could not turn these goods out as quickly, and consequently not as cheaply as the mill can who is making only this one thing."

Surely any buyer with any common sense would see by this time that he had made a mistake, that the only thing for him to do is to buy the different kinds of goods from the mills who make a specialty of such goods, and that if the mill this salesman represents is making a specialty also on only one kind of goods, such as men's union suits, then that is the mill to buy such goods from, and the other the mill to buy the other kind from and so on. Should this policy be insisted upon by all mills, it would not be long before the retailer would know just exactly where to get various kinds of underwear, a finished product, the most value for the least money possible; and he would send in his order for his requirements from time to time, and the salesman would not have to resort to all kinds of argument to get someone to buy the goods, but would have an easy time of it, and perhaps be able to stay at the mill and help to produce something.

Someone might by this time object by saying this would stifle individuality. It this a fact; does individuality consist of variety or a fixed quality? We surely have to agree to the latter.

For an illustration, if all mills would insist on making only certain lines within a prescribed radius, limiting to men's two-piece or union suits of either heavy or light weight; not both unless the mill be so large that it would be done in two mills separate and distinct one from another with their own equipments, would this not develop individuality? It surely would, and to such an extent that anyone could pick up a garment and say, men's heavy cotton union suit. Type so and so, made in such and such a town. Individuality developed not only in the finished product, but also in such value for the money that no one else could touch it. The individuality so highly developed in the specialized garment that the mill need not make, this, that, or something else because somebody else did in order to get business.

Someone might say, this sounds good, but it never can be done. We agree to that if every manufacturer is to sit tight and say, every time I see some garment that somebody else makes I am going to copy it and make a few dozen like it because I think that it is a winner. Why, of course, there never can be a change in anything unless a change be made.

The writer stated at the beginning that he did not want to set himself up as an expert on political economy, but that he rather would apply common sense to the subject. Few like to be radical, but it is safe to state that the time will undoubtedly come when each mill will make only a certain kind of goods, and not every mill make every kind of goods.

This condition of things may not come until the mills have so much diversified machinery, and the product so cut up that they will be willing to swap machinery with someone else for a little more of that same thing or kind. Should mills specialize, they would have just as much business as before as the aggregate business would be just the same as if every mill made every kind of goods.

In a machine shop in order to insure efficiency, they would have one man run a certain kind of machine all the time. We simply would suggest the same thing for the knitting mill. The fault of getting out such a variety of styles of underwear does not lie with the consumer, but with the buyer of the underwear and the mill for wanting to comply with these buyers. By the buyer we do not mean the person who buys the garment to wear, but the fellow who does not intend to wear it, but is looking for some easy merchandise to make money on. Here, then, is another good reason why the mill should not sell to middle men at all. The more the goods are handled makes just that many more to please, and it is pretty hard to please everybody.

A Denier is a silver French coin, value one-twelfth of a sou and weighing 27 Paris grains (19.6728 Eng. grains), says the Hosiery Trade Journal, and is used as a standard weight for silks. Two systems of calculating silk are in use, viz., the *denier* and the *dram* system. Raw silk is generally indicated by the denier system, whereas thrown silk is mostly indicated by the dram system. The *Legal Denier* in the United States is a skein of silk 450 metres long, wound in 400 turns on a reel of 112½ centimetres in circumference and weighed by a unit of five centigrams, known as denier. One metre equals 39.36 inches, therefore one legal denier equals 450 metres, or 492.12 yards. One pound equals 453.6 grams, one ounce equals 566.99 legal deniers, one gram equals 20 legal deniers, hence one pound equals 9,072 legal deniers. Since one legal denier equals 492.12 yards, consequently 9,072 legal deniers are equal to 4,464,513 yards. Dividing the latter by any denierage gives it yardage per pound.

The standard of the denier varies considerably in different parts of Europe, viz.:

International, 500 m—0.05 grams.
Turin, 476 m—0.05336 grams.
Milan, 476 m—0.0511 grams.
Old Lyonese, 476 m—0.05311 grams.
New Lyonese, 500 m—0.05311 grams.

If you are successful in your business, keep your head. Remember a man can make money but money cannot make a man.